EXCAVATING ENGINEER

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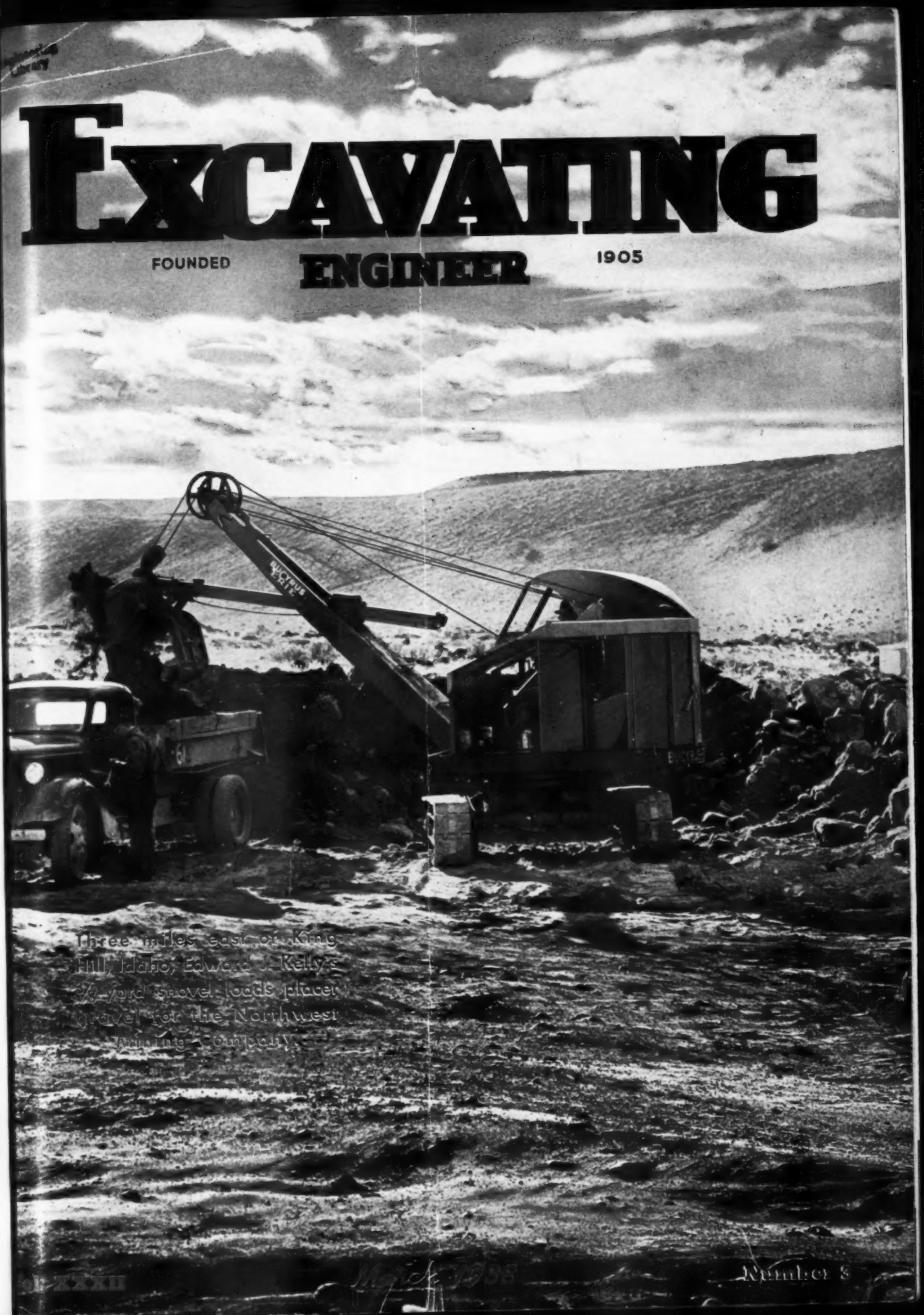
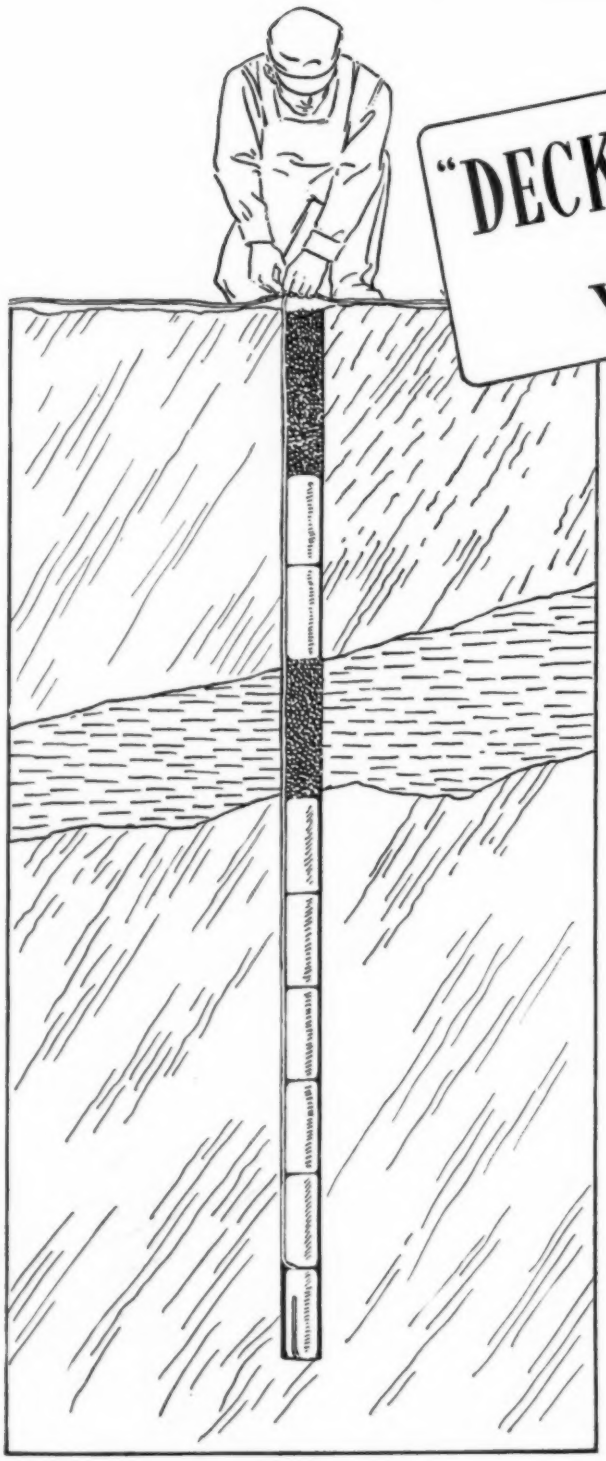


Three miles east of King Hill, Idaho, Edward J. Kelly's ¾-yard shovel loads placer gravel for the Northwest Mining Company.

Number 3



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CORDEAU·BICKFORD *Detonating Fuse*

Vol. XXXII **March, 1938** No. 3

Gold Mining ..... **Front Cover**
Edward J. Kelley's ⅜-yard 10-B proves successful rig for loading placer gravel at Idaho mine.

Frontispiece **144**
Working in tough ore, Cleveland Cliffs Iron Co. 9-inch blast hole drill gets sharpened bits via tractor-drawn wagon.

By-Pass Highway — By Spencer A. Jones **145**
Wm. P. McDonald excavates for new Long Island highway with tractor equipment and small draglines. Scrapers prove efficient in extremely soft soil.

Cutting Drilling Costs **148**
Cleveland Cliffs Iron Company finds 9-inch blast hole drills save 26 cents a foot over 6-inch rigs in northern Michigan mine.

Men and Machines — By John R. Marcy **150**
Progress at San Jacinto on the Colorado River Acqueduct illustrates the importance of modern equipment.

Handling Sugar Beets **153**
E. W. Coons Co. uses 37-B dragline with 2½-yard bucket in unusual material-handling job in Minnesota.

All-American Canal — A Summary — By Jos. C. Coyle ... **158**
Just how far along is this giant project? With only about 100,000 yards of excavation remaining under present contracts, Mr. Coyle takes you down the line of contracts and shows you how things stand.

Equipment You Ought to Know About **154**
Two-Cycle Diesel Engines.. 154
Snow Plows 154
Pressure Lubrication 154
Earth Drill 154
New 1-Yard Excavator ... 155
Low Pressure Tires 155
Renewable Pumping Units. 155
Thread Forging Device ... 155

Editorial **156**
A Platform for Recovery.. 156

Field Notes **162**
Broken Bones 162
Welder's Tool Tray 162
"Speak Now" 162

Ex-Laffs **166**

Shots from the Firing Line **168**
Grand Coulee Contract.. Awarded 168
Buenos Aires Super Avenue 168
New Mississippi Road Program 168
Report on Highway Accidents 168
Gila Crossing Award 170
Heavy 1937 Motor Tax Bill 172
New ARBA Officers 172
Bartlett-Hayward Wins Coulee Gate Contract... 172
Two Reclamation Dams Completed 174
Caterpillar 1937 Earnings.. 176
1937 Fort Peck Progress... 176

Not in the Contract **178**

Book Reviews **184**

Trade Notes **186**

LOOKING AHEAD

These interesting articles will appear in an early issue of EXCAVATING engineer. Watch for them.

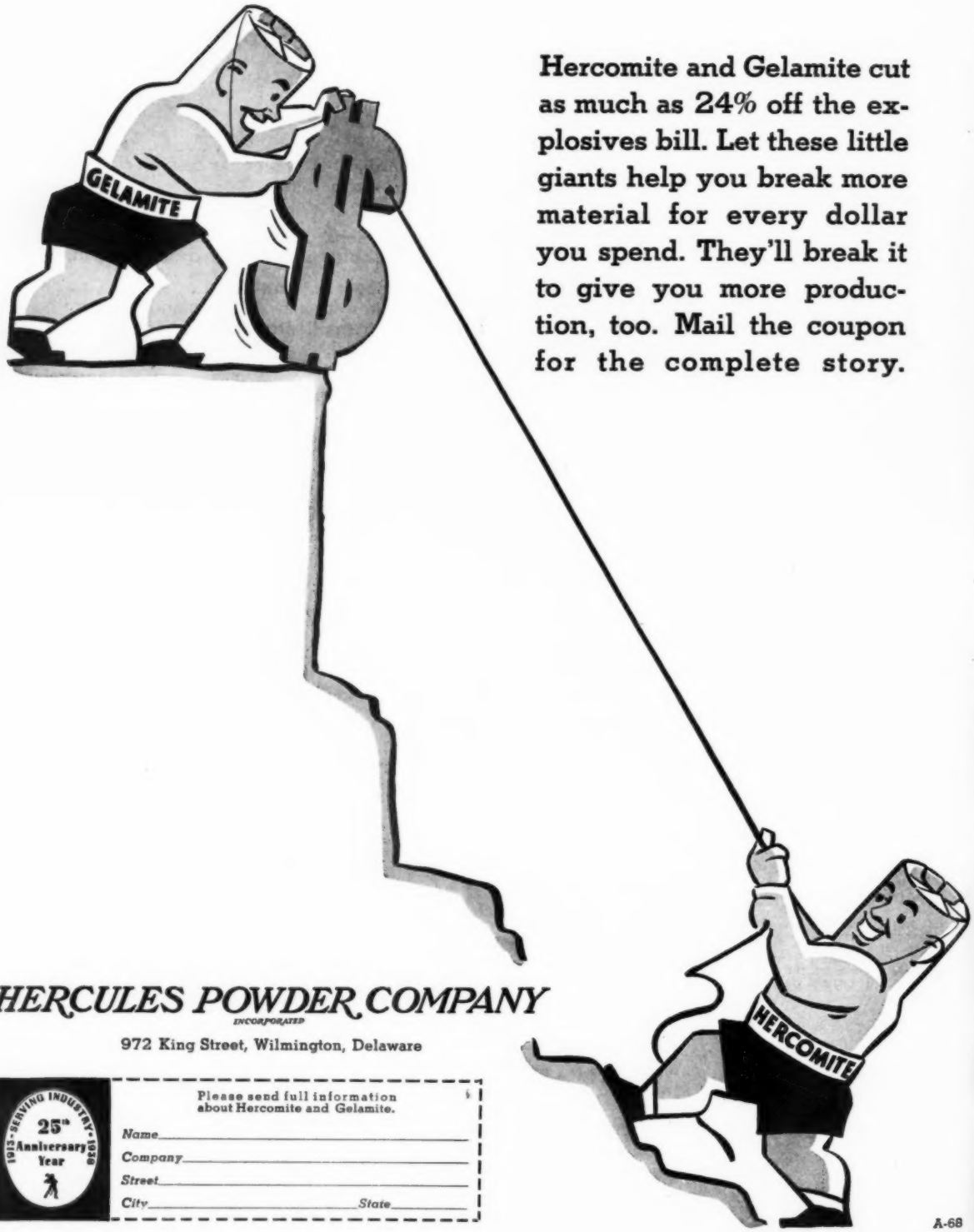
Limestone

Herzog Lime & Stone Company uses 3-yard electric shovel in loading to small, speedy trucks which cut hauling costs.

Strip Mining at St. David

Central States Collieries use new-type 16-yard stripper and 5½-yard loading shovel in averaging a coal output of 60,000 tons per month. Modernity is keynote of the entire operation at the Little Sister Mine in Illinois.

GETTING COSTS DOWN



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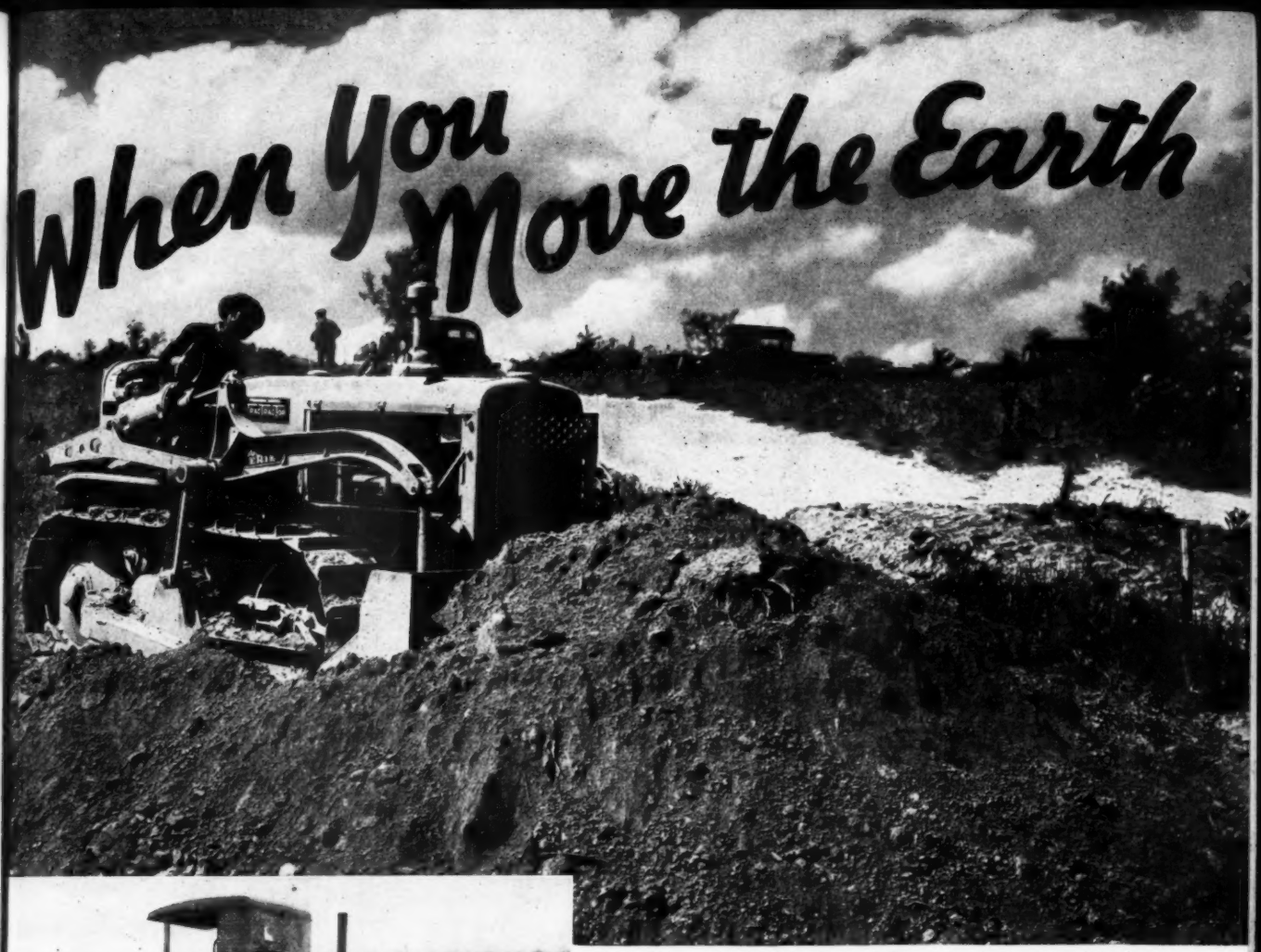
When You Move the Earth



This is the International T-40 TracTracTor bulldozing dirt. An International Diesel engine is also available for this sturdy crawler. International Industrial Tractors are readily adapted to a wide variety of in-built equipment.

International Industrial Power has brought *economy* to highway maintenance for years. Here is an International Diesel-powered motor patrol, cutting costs wherever it works.

An International T-20 TracTracTor pulling a sheep's-foot roller, and in the background a larger International with bulldozer.

● More dirt-moving is being turned over to International TracTracTors all the time because they have the stamina this rough-and-tumble job demands. In no other service does TracTracTor design and International Harvester *quality* construction show to better advantage. Year-after-year performance on the job has proved the value of the many features International Harvester has brought to the crawler-tractor field.

International TracTracTors convert an *exceptionally large percentage* of their engine power into useful work. All vital parts are *completely protected* against entrance of abrasives and water. No matter how thick or penetrating the dust, the oil seals in TracTracTors keep it out. Steering clutches, operating on high-speed shafts, permit *"finger-tip" control* that gives *extra quick* response and *extra ease* of operation. Steering clutches and brakes are *so readily accessible* that they can be inspected, adjusted, or replaced in a minimum of time.

Such things as these are reflected in the cost sheets—they make possible the *economy of operation and maintenance* for which TracTracTors are famous. These crawler tractors are available in five different models, for gasoline and Diesel operation. There also are five wheel tractors in the International line, and power units ranging up to 110 max. h. p. Ask the nearby International dealer or Company-owned branch for complete details.

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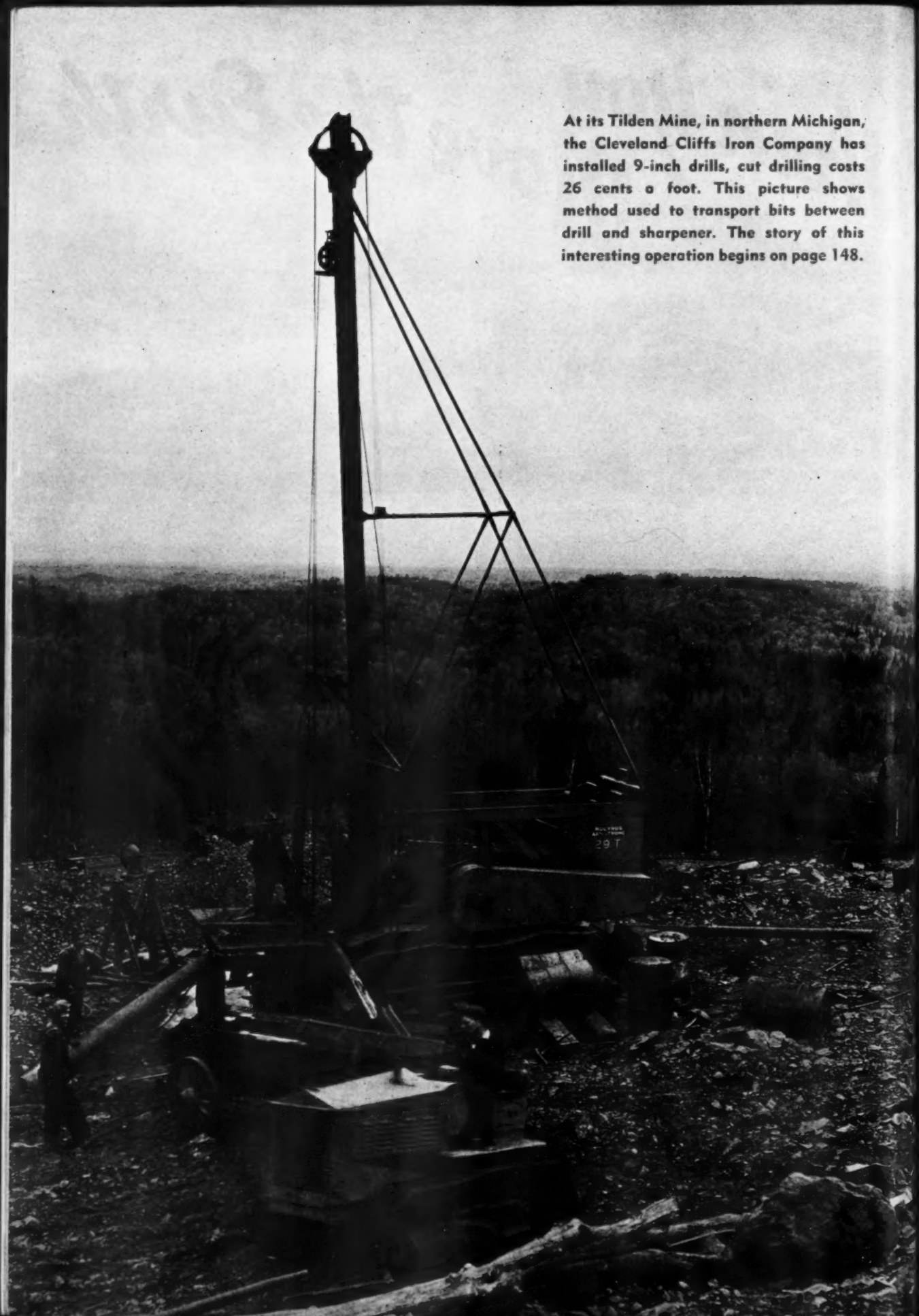
INTERNATIONAL Industrial Power



At its Tilden Mine, in northern Michigan, the Cleveland Cliffs Iron Company has installed 9-inch drills, cut drilling costs 26 cents a foot. This picture shows method used to transport bits between drill and sharpener. The story of this interesting operation begins on page 148.

By-Pass Highway

Wm. P. McDonald Construction Company finds 4½-yard scrapers efficient in excavating for new highway in Suffolk county, N. Y.

By SPENCER JONES

NEAR the eastern end of Long Island, the Wm. P. McDonald Construction Company of Flushing, N. Y., is building 4.449 miles of concrete highway which will by-pass through east-west traffic north of the town of Riverhead, county seat of Suffolk County.

The McDonald contract, totaling $250,000, includes seven highway intersections and three culverts. One of the latter is a 6′ by 6′ reinforced concrete box. Through this runs a narrow gauge railroad along which a local duck farmer moves cars of feed. The two other culverts are parallel 60″ reinforced concrete pipes which will permit the same farmer's ducks to swim under the new highway.

On October 13, 1937, the contract was let, and work started seven days later. The job must be completed by August 1, 1938. At the present time, grade work is about 80 per cent complete. Included in the contract are: a lump sum of $4,000 for removing scrub oak and pine from the 66-foot right of way; 160,000 cubic yards of earth excavation at 23 cents a cubic yard; about 12,000 yards of borrow to be furnished and placed by the contractor for 25 cents a yard.

The fine grade on which the concrete will be laid involves 85,000 square yards of surface, to be handled for a contract price of 10 cents per square yard. About 25,000 linear feet of shoulder trimming, at 18 cents a foot, will be required, together with a total of 3,082 linear feet of 15″, 18″, 24″,

● A major part of the excavation for this 4.449-mile highway, under construction by the Wm. P. McDonald Construction Co., is being handled with tractor-drawn scrapers and bulldozers.

and 60" reinforced concrete pipe at $1.50, $2.00, $2.50, and $14.00 a foot respectively. Also, a total of 1700 feet of plain concrete pipe will be used.

Other contract quantities and prices include: 23,000 barrels of Portland cement at $2.35; 13,200 cubic yards of concrete paving at $6.25 a yard; and 5800 concrete blocks at 16 cents each.

As originally planned, the job was to be opened up with tractor drawn scrapers, and then shovels and trucks were to handle the main excavation. However early scraper work proved so effective that it was decided to handle a large part of the job with tractor equipment. This necessitated only minor changes in the proposed plan of operation.

Test borings along the route showed the material to be principally sand, with roots, top soil and some loam and moisture near the surface. From six to eight feet down, the sand is coarse, dry and relatively hard to handle. There is no rock encountered along the entire 4½ miles.

No Deep Cuts Or Fills

The deepest two cuts required are 17 and 14 feet deep respectively, and each will require removal of about 23,000 yards of sand. The highest fills—19 and 13 feet—will contain some 24,000 yards each. Because one fill is a mile and a half from the nearest cut, it was decided to borrow 12,000 yards from a point requiring a haul of only 600 to 700 feet.

Slope angle of cuts and fills is one foot rise for every two feet of horizontal distance. Maximum grade will be 1.7 per cent. The highest point on the finished road will be 65 feet above sea level; the lowest, 10 feet.

Two Bucyrus-Erie draglines, a ⅝-yard 19-B and a 1-yard 34-B are working on parts of the job where sand and loam are firm enough to permit efficient truck operations. A total of about 55,000 yards will be handled with these two rigs. To date, average output per 8 hour shift has been 550 yards for the 19-B (average haul being 2,000 feet), and 1,100 yards for 34-B (average haul, 4,500 feet).

● **Top: This view gives a good idea of the soft ground comprising most of the work handled by the tractor equipment. Bottom: 1100 yards per 8-hour shift is average output of this 1-yard dragline loading to trucks.**

A total of 117,000 yards will be handled with the five scraper units now operating. These rigs are working where the soft sand offers a minimum of traction that would make use of trucks extremely difficult. Before it was decided to do such a sizable part of the work with scrapers, a thorough 5-day test of three units was carried out on the job.

Test Run

Unit No. 1, a 4½-yard Bucyrus-Erie 4-wheel scraper, drawn by an International TD-40 Diesel Trac-TracTor operated a total of 34.75 hours without lost time. Working on an average haul of 522 feet, this unit moved a total of 1,951½ cubic yards; an average of 56.2 yards per hour. Average load per trip was 4.11 cubic yards; an average of 13.65 trips per hour was made.

Unit No. 2, identical with No. 1, operated a total of 34.25 hours two 15-minute "time outs" being necessary over the test period. This unit moved 2061½ cubic yards on an average haul of 514 feet. Average dirt moved per hour was 60.3 cubic yards, with 4.25 yards being the average pay load, and 14.15 trips being made per hour.

It was the results obtained on these tests that decided the McDonald organization to increase the share of work to be handled with tractor equipment. Two more

International TracTracTors and Bucyrus-Erie 4½-yard scrapers were moved in on the job. A Bucyrus-Erie bullgrader and bulldozer, each mounted on a TracTracTor were brought in to handle the grading.

Since the tests, comparable outputs have been maintained with the tractor equipment working five 8-hour shifts weekly.

Normal paved section on this job will be 20 feet wide and 7 inches thick, with a rise of ⅛-inch per foot from side to center line. Rough grade is sand, and will be compacted with a heavy roller.

● **Top: A general view of early excavation work, showing three of the tractor equipment units and the ⅝-yard dragline. Bottom: Draglines and trucks are used where firm footing and longer hauls give them the advantage. 550 yards per 8-hour shift is this dragline's average output.**

Along one side of the rough grade, the contractor is spreading a 6-inch layer of loam wide enough to make a driveway on which the concrete batch trucks can get to the paver. Without this, it would be difficult for even an empty truck to get sufficient traction for most of the necessary distance.

Rain Helps

Incidentally, this is one job where rain is almost welcome, as the sand becomes firmer and has considerably greater bearing power when moist.

This highway is noteworthy for the lengths of its tangents, four of which are over 2,000 feet long each. One is over 4,400 feet, and another more than 5,500 feet long.

Included in the work is construction of 19 or 20 catch basins of class "C" concrete, and 27 leaching basins. These latter are dry wells without outlet except as they are constructed in tandem. Basins are built of concrete blocks. Of the bottom six courses, three alternate ones are laid with the holes running horizontally so water can run through them into the surrounding gravel and crushed stone.

About 35 men are employed on this McDonald job, working an 8-hour day with a total of 40 hours per week.

Minimum hourly wage rates under the New York State Labor Law are:

Carpenters	$1.00
Concrete Paver Operators	1.92½
Shovel Operators	2.12½
Crane Operators	1.92½
Roller Operators (up to and including 7 tons)	.85
Roller Operators (over 7 tons)	1.65
Tractor Operators	.85
Bulldozer Operators	1.25
Concrete Mixer Operators	.75
Truck Drivers	.93¾
Common Laborers	.65

Personnel

The Wm. P. McDonald Construction Company was organized in 1912, and its president is Wm. P. McDonald. Mr. McDonald's experience in the dirt-moving business antedates the formation of his company by several years. He is a past president of the American Road Builders' Association. He has handled road jobs, large and small, from eastern Canada to Florida.

Mr. Wm. J. McLain, General Superintendent, is in charge of the job described here, ably assisted by grade foreman William DeWall, timekeeper Daniel Stanton and office manager Julian Haigh.

Legal owner of the new road is the county of Suffolk, through its Board of Supervisors of which W. F. Greenhalgh is chairman. The highway was designed under the supervision of H. F. Bishop, County Superintendent of Highways, with Albert Cass as Designing Engineer. Harry Tuthill is Construction Engineer, H. Lee Dennison, Chief Draughtsman; F. W. Hunninghouse, Right of Way Engineer; and A. J. Magadini, Junior Engineer.

Cleveland Cliffs Iron Company puts in 9-inch blast-hole drills and reduces operating costs 26 cents a foot.

CUTTING DRILLING COST

MINED by the open pit method, the Tilden Mine of the Cleveland Cliffs Iron Company, in northern Michigan, produces a hard, highly abrasive ore which is used for flux in blast furnaces. This ore runs about 40 per cent iron and 40 per cent silica. The Tilden Mine is made up of two pits about 800 feet apart, which are independently equipped, but the ore from each goes to a centrally located crusher. After crushing, the ore is shipped by railroad to Marquette or Escanaba, and thence by boat to designated lake ports.

Truck haulage is used in both pits, with small steam locomotives pulling Easton cars, each of which has two 10-yard dump bodies. Production at this mine was started in 1929. The west pit, first to be operated, is on a side hill. Present face is about 100 feet high and 1200 feet long. Loading in this pit is handled by two electric shovels, a 2-yard Marion 480E, and a 2½-yard Bucyrus-Erie 80-B.

The second pit, more recently opened, presents more loading difficulties. It was necessary for the loading shovel, another Bucyrus-Erie 80-B, to cut directly into the ore to start the pit, which is at present only about 150 feet wide. The usual spot is 3 cars of 2 bodies each, except for 20 per cent of each blast when only two cars at a time can be spotted for loading. Average output for both pits is about 2,000 tons per 8-hour shift.

The bulk of the stripping is done with shovels which load to trucks. Final stripping and clearing the ledge is carried on ahead of the drills by the hydraulic method, as illustrated in one of the accompanying pictures. Six-inch blast holes were used at the Tilden Mine until late in 1936 when the first of the 9-inch Bucyrus-Armstrong drills was put

● This view of the face shows the hard, highly abrasive ore mined at the Tilden Pit. Drill bits must be changed every four feet for maximum efficiency in this tough material.

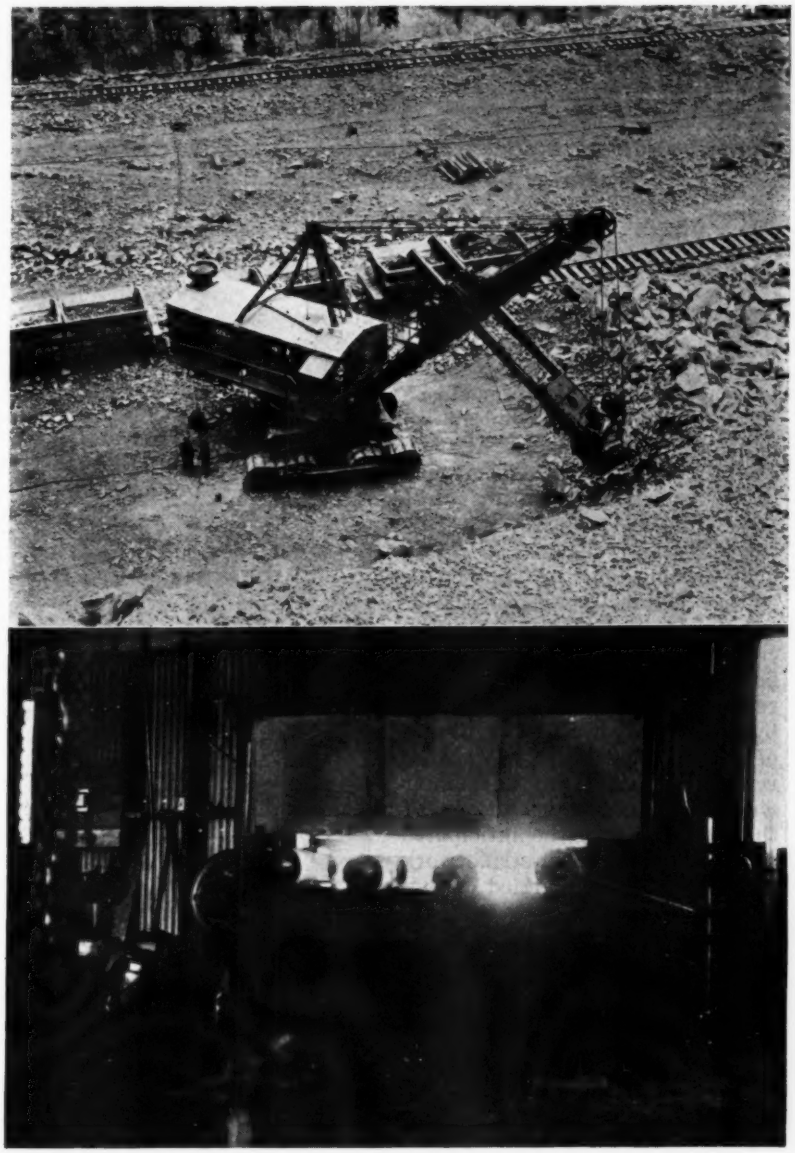
into operation. Six-inch holes were spaced on 15-foot centers, in rows 22 feet back from face. Average burden per foot of hole was 330 cubic feet, or 24 tons for this 6-inch hole. Not including depreciation, overhead and other fixed charges, operating cost for 6-inch hole was $1.95 per foot.

Average operating cost per foot with the two 9-inch 29-T's now in use has been $1.69, or 26 cents a foot less than for the previously drilled 6-inch holes.

One of the new rigs is drilling for each pit. The 9-inch holes are an average of 100 feet in depth; are spaced on 20-foot centers, in rows 30 feet back from face. Before one row is shot, the position for the next is marked, so that the correct spacing of 30 feet is assured. Holes in this second row are put down midway between those in the previous row, and are drilled about 5 feet below pit level. This, and staggering successive rows, eliminates to some extent the possibility of blasts leaving an unbroken toe.

Average rate of drilling the 9-inch hole has been 15.6 feet per 8-hour shift, compared to an average of 13.7 feet obtained with the 6-inch rigs. The 9-inch rigs swing 2,700 pounds of tools as against 1,500 for the previous rigs, which gives an increase of 50 pounds weight for each inch of cutting diameter. From 56 to 58 strokes per minute is normal operating speed for the 29-T's. Average burden per foot of 9-inch hole has been 600 cubic feet, or 44.5 tons—an increase of 82 per cent in volume and tonnage over the 6-inch hole. Drilling costs per ton were 8 cents with 6-inch hole; have been reduced to 3.8 cents with the new drills.

The bit sharpening problem is taken care of by a Bucyrus-Armstrong No. 12 Bit Dresser located between the two pits. A small tractor, pulling a 4-wheeled wagon, takes the bits, a load at a time from the drill to dresser and back again. To keep up with the drilling, the Bit Dresser, with a crew of three men, must sharpen 15 to 20 bits per 8-hour shift. An average of four feet can be drilled efficiently in this tough material before changing and resharpening is necessary.



● **Top: The west pit at the Tilden mine. A 2½-yard electric shovel loads ore to three-car trains. Note how each car is made up of two dump bodies. Bottom: Bit sharpening is handled midway between the two pits by a Bucyrus-Armstrong bit dresser, operated by a three-man crew.**

Details of loading vary with different conditions, and number of holes fired per shot ranges between 30 and 60. Nine-inch holes are loaded with 7½-inch powder (5-inch was used for 6-inch holes). Gelamite No. 2 and 80 per cent gelatins are used. Holes are blasted with Cordeau Bickford running the full depth of each hole and connected by another length of Cordeau which links all holes together and permits simultaneous firing. An average of about 3 tons of ore is brought down per pound of powder, not counting secondary shooting.

Fragmentation with the 9-inch holes has been good, as can be seen in the accompanying pictures. Ore from both pits is delivered to the crusher. One primary and two secondary gyratory crushers reduce the ore minus 2½ for shipment.

For the Cleveland Cliffs Iron Company Mining Department, S. R. Elliott is Manager, and G. R. Jackson is General Superintendent. F. J. Haller is Engineer.

Men *and* Machines

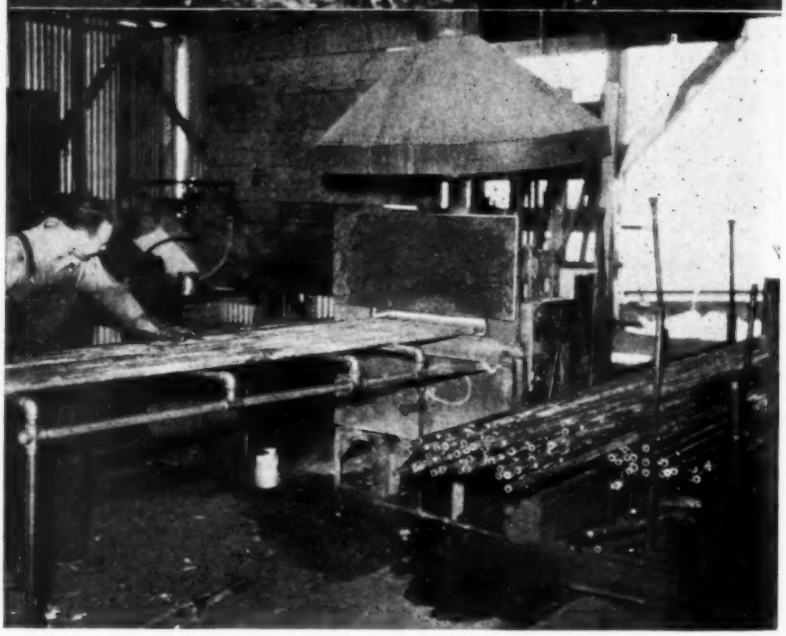
Contribution of modern equipment to excavating progress is shown by unusual situation on the Colorado River Aqueduct.

By JOHN R. MARCY

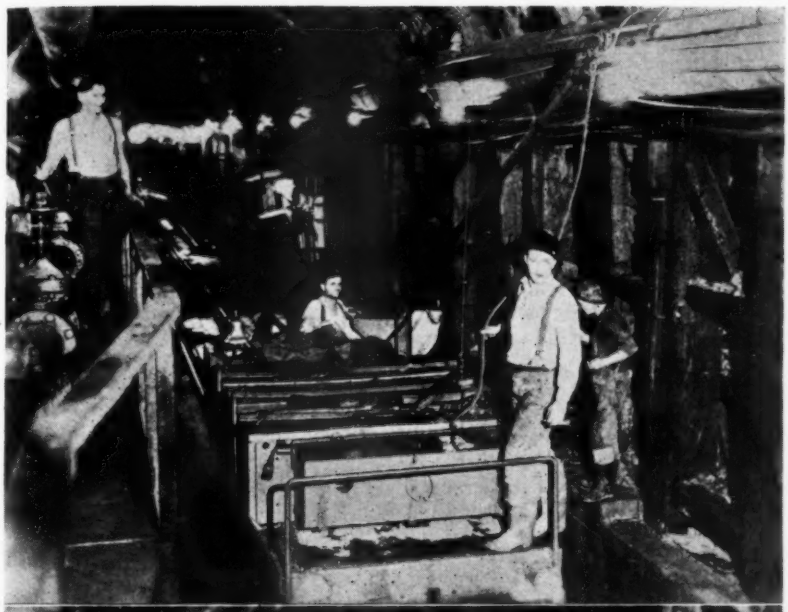
NO MORE convincing example of the part played by modern equipment in present-day construction could be adduced than that brought to light by developments at San Jacinto tunnel on the Colorado River Aqueduct as the result of the strike in progress there as this is being written. The Aqueduct is being built by The Metropolitan Water District of Southern California which includes the city of Los Angeles and 12 neighboring municipalities. On this job record speeds had been achieved by the striking crews, but in spite of the fact that these crews were replaced with men unfamiliar with the peculiar conditions of the job, in spite of the anticipated accident hazard, post-strike work has not only been carried on efficiently, but has actually exceeded the pre-strike average speed, and the accident frequency has been materially reduced. The answer is machines — machines so efficient and simple to operate that anyone can be trained to use them effectively and safely.

It should be stated at the outset that this account does not concern itself with the merits of the strike, either pro or con, but is interested only in certain results brought about because of it.

These developments have taken place on the San Jacinto tunnel which is being driven through the mountain of the same name. The tunnel is 13 miles long and is being driven from several headings. About 1.6 miles from the eastern end is Cabazon shaft, and from it driving progressed in opposite directions from two headings. The 1.6 mile to the east portal has been holed out and concrete lined. Driving is now in progress in the western heading. On the other side of the mountain Potrero shaft was sunk about three miles from the west portal, also with headings in opposite directions. Drilling was also carried on here from a heading at the portal, and the three miles to the shaft has been holed out and concrete lined. At present work is being carried on only from the east heading of the Potrero shaft. About halfway between Cabazon and Potrero the Lawrence adit is being driven so that two addi-



● **Top: Underground battery and machine shops, located conveniently near the work, save time. Both in planning and operation, every effort consistent with safety is made to keep work at top speed. Bottom: Tempering drill steel. Rods are hollow, and water for cooling is forced through them during operation.**



● Top: Muck trains are pulled by electric locomotives like this. Safety and efficency recommend this type of unit for aqueduct work. Booster pump at left is used for dewatering the shaft. Bottom: Wet work at one of the headings. Excessive water has been a constant problem on San Jacinto work.

tional headings may be established. Success in sinking the Lawrence incline adit may be credited to the adaption of a mucking machine suitable for mucking the broken rock on the 25 per cent slope. Approximately 3½ miles of the entire tunnel remain to be excavated.

From May, 1933, when work on the tunnel was first begun, to February 12, 1935, the work was in charge of a contracting firm. At that time the District took it over, and it has since been carried forward with forces employed directly by the District.

Excessive Water a Problem

Conditions here have differed from those encountered elsewhere in the 104 miles of the aqueduct's hard-rock tunnels in that excessive quantities of water have been present. At some of the headings it pours down in sheets on the hard hats of the workers, causing poor visibility and difficult working conditions. Pumps of great capacity have been necessary to remove the water.

In spite of this fact an average speed in two headings of 21.1 feet per day has been maintained for the past two years since the District took over the work. This average compares favorably with the best averages on the other tunnels. Record-breaking speeds have also been attained here at various times. Just previous to the strike, San Jacinto crews had just hung up another conspicuous San Jacinto tunnel driving record.

On August 14, 1937, a C.I.O. union called the strike, and while work was never suspended it was greatly retarded for a time as crews were gradually replaced.

During the latter half of the month of August immediately after the strike was called, progress suffered most. Replacements were not inexperienced, but were, as far as possible, recruited from men who had been employed on other tunnels and been trained in the use of equipment according to the practices set up by the District. This latter was an important element, as will be explained later. At the same time, it must be remembered that the set-up at San Jacinto was radically different from that anywhere else along the line; so much so that it was regarded as a decided asset to the strikers, for it was generally believed that new crews would have hard and slow going on that account.

During September the number of men on the job was built up from 600 to 996, or nearly to full strength. This number, however, was not reached until the end of the month, so that for the whole month the average number working was considerably less, and for at least part of the time operations were carried on with crews a good deal under full strength.

Good Progress with New Force

The average progress for September was 21 feet per day, just under the 21.1 feet average for the two previous years. A total of 630 feet was driven in the main tunnel during the month,

● Modern mucking machines such as this have made possible record performances hung up on the aqueduct. On the San Jacinto tunnel, adaption of a mucker to work on a 25 per cent incline speeded output.

and 90 feet in the Lawrence adit. The Cabazon heading was advanced 460 feet, and the Potrero heading 170. All excavation work from these two shafts was on main headings, work on the pioneer headings having been previously suspended when underground conditions no longer required their use. Excavation on the Potrero pioneer was suspended on August 11, and the Cabazon pioneer on July 26.

The September progress in Potrero was the best that had been made in that heading since June, and the Cabazon crews during the same time averaged 15.3 feet per day as compared to the average of 12.6 feet per day that had been made in that heading during the period since February, 1935. There were four days during the latter part of the month when footages in excess of 24 feet were recorded.

Over the Average

By the 6th of October the number of men had been increased to 1,035. This was practically a full crew, only a few additional workers being required. The average daily progress continued to increase. On October 1, 3, 4, and 6, Cabazon crews maintained their 24 feet per day. Potrero footage spurted. By the end of the month a total of 901 feet had been driven on the main tunnel, and the record showed a daily average of 28.8 feet, or 7.7 feet in excess of the daily average for the pre-strike period.

During the first 15 days of November, the 1,100 men working on the main tunnel excavated 554 feet of the 18-foot diameter bore at an average rate of 37 feet per day, an increase of 16 feet per day over the pre-strike rate. The Cabazon crews averaged 27.3 feet per day during the first eight days of November, and the Potrero crews 15 feet during the same days. On November 6 Cabazon crews drove 36 feet. On the same date Potrero was advanced 25 feet, which contrasted with the 8.3 feet pre-strike average in this difficult tunnel, is an astounding record.

In close to one month's time, then, progress was "back to normal." In three months it was nearly twice the pre-strike average, and still advancing as this is being written. Natural difficulties had not lessened. On the contrary, extraordinary troublesome rock conditions had been encountered, and heavy water inflows had been experienced during the period. At Potrero the inflow on October 11 was the heaviest so far met with.

Safety

Because it was recognized that the problem of maintaining safe working conditions here with completely reorganized crews was a real one, special care was taken to insure the observance of the safety practices set up by the District through its safety department. The complete story of this extraordinarily successful safety program has been published in a recent issue of Excavating Engineer, and need not be repeated here.

The accident rate for the whole aqueduct has been considerably lower than the frequency of 151 for comparable heavy construction in the state of California. On those jobs under direct control of the District the rate has been consistently lower than on those carried on by contracting firms, a fact which seems to indicate that the frequency decreased proportionately to the nearness to the center of authority.

At San Jacinto the accident frequency for the time until the

(Continued on page 157)

Handling Sugar Beets

E. W. Coons Company "Makes" News-Reels With 2½-yard Crane Loading Sugar Beets On Unusual Minnesota Job

IF YOU are a regular movie-goer, you may have seen the Pathe News-Reel shots of the E. W. Coons Company Bucyrus-Erie 37-B crane loading sugar beets from stock pile to trucks.

The job is an unusual and interesting one, done on contract for the American Crystal Sugar Company at East Grand Forks, Minnesota. The job is an annual one, though it does not run throughout the year, and consists of handling sugar-beets — the company's raw material — from railroad cars to the plant. E. W. Coons Company, whose home office is at Hibbing, Minnesota, began work on this year's "installment" on October 1, 1937, and finished on January 3, 1938.

The operation is really divided into two steps — unloading the beets from cars to stock pile, and loading from stock pile to trucks for delivery at the American Crystal Sugar Company plant.

The first step is one that is especially important, and must be up to schedule. To hold up to best advantage, the beets should be piled when the weather is cool and dry. Through the season, the E. W. Coons forces unloaded about 5,000 tons per 24-hour day. Two cranes were used for this work, the Bucyrus-Erie 37-B and a Northwest Model 105. In order to increase capacity of the 37-B for this work, it was equipped with a 2½ - yard Owens clamshell bucket. Average output for this rig was 140 tons per hour; for the Northwest, with a 1¼-yd. Williams bucket, output averaged 60 tons per hour.

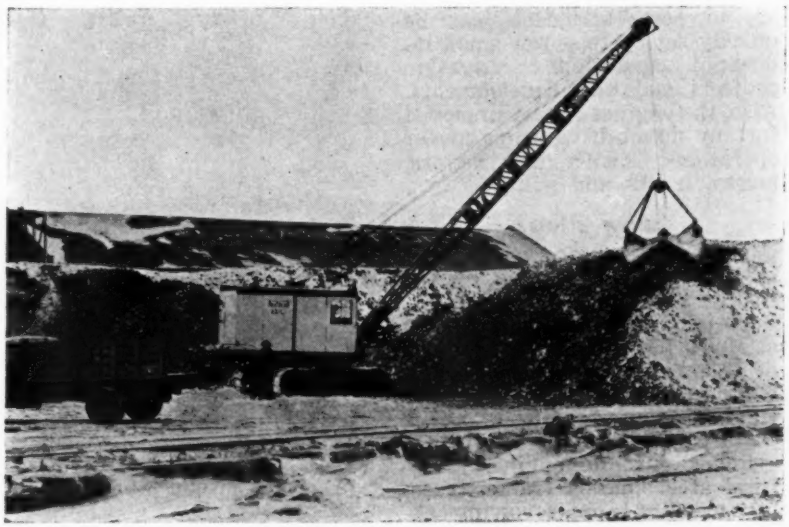
A total of about 75,000 tons was unloaded by this method this year. Trucks from the immediate vicinity stockpiled another 50,000 tons. With this total of 125,000 tons, the second operation was begun.

Beets were loaded into three International D40 trucks, and dumped into a hopper which is directly over a flume running into the plant. Average haul from stock pile to hopper was 1400 feet. Trucks hauled about 4.5 tons per trip, and were loaded by the 37-B in 30 seconds. Only the one crane was used on this part of the job, as it was not one requiring capacity output. The plant could take just so many tons of beets per shift, an amount easily furnished by the 37-B and 3 trucks, working three 8-hour shifts. Average output for this loading was 630 tons per shift, with a total of 66 days being taken to load the 125,000 tons. A fourth truck is used as a "relief," to permit keeping all hauling units greased, repaired, etc.

Fuel consumption for the 37-B averaged 32 gallons per shift in the unloading work, and 20 gallons per shift while loading to trucks in the second stage of the operation. The rig was greased every 6 hours, with an oiler constantly on the machine to insure proper maintenance. Trucks were greased every day and oil changed every 60 hours.

W. C. Cohoe is President and Treasurer of E. W. Coons, Inc. W. E. Wilson is Vice President. Niel Gillis was Superintendent for the beet handling job in East Grand Forks. The company maintains a southern office in St. Petersburg, Florida, as well as the headquarters in Hibbing.

● Having previously stockpiled sugar beets from railroad cars, this dragline — equipped with 2½-yard bucket—loads the beets to trucks for delivery to the American Crystal Sugar Co. plant in East Grand Forks, Minn.

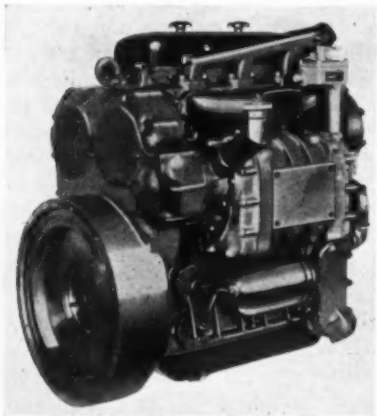


Equipment you ought to KNOW ABOUT

Two-Cycle Diesel Engines

General Motors has announced its plans for the establishment of mass production and sale of small, light-weight, two-cycle Diesel engines for all purposes.

Until now, General Motors has limited its Diesel activities to the building of larger two-cycle engines of from 600 to 1200 horsepower. The new engines extend this line in varying sizes down to a one-cylinder 22 horsepower model.



An outstanding feature of the announcement is that the "packaged power" units, consisting of the small-model Diesel engines and generators, in either stationary or portable models, can be quickly set up to power small industrial operations, irrigation projects, and other developments. Also, the engines can be employed for any direct-drive prime mover operations, such as tractors, hoists, trucks and pumps.

Snow Plows

A creeper-mounted snow loader is offered to the market by the George Haiss Manufacturing Co., Inc., New York, New York. Known as Model 75 it has a rated capacity of 10 cubic yards per minute and will handle slush, frozen snow, or ice in addition to soft snow. Other features are a radiator-cooled, 4-cylinder gasoline engine, structural steel chassis frame, truss-type elevator boom, revolving cutting propellers feeding to the flight conveyor, and a swivel spout discharge chute.

Pressure Lubricator

On bearings, gears and other moving parts of machinery where oil is needed, the Acco Morrow Pressure Lubricator, recently announced by the American Chain & Cable Company, Inc., York, Pennsylvania, is said to be able to supply lubrication at pressure up to 1,000 pounds. Such pressure lubrication flushes out grit and dirt from a machine and at the same time forces oil into bearings.

The "Oilingseal" tip, made of compressible composition is one of the Acco-Morrow Pressure Lubricator features. This tip makes a pressure-tight contact on the top edge of any common oil hole and practically all sizes and types of cups and oil hole covers in general use. No special fittings are needed.

Earth Drill

The Buda Company, Harvey, Illinois, has just announced a new truck mounted Buda-Hubron Earth Drill. This drill is mounted on a 1½ ton truck of 131" wheel base and is for digging holes for foundation work for buildings and bridges, for pilings and drainage.

It will dig holes to 42 inches in diameter and to 50 feet in depth. In average soil it digs a 6-foot hole, 24 inches in diameter, in 3 minutes, and a 30-foot hole in less than 30 minutes. It is equipped with either a 2-cylinder or a 4-cylinder gasoline engine and all parts of the drill head are assembled in one unit, the drill head being dust proof. The chains on the lifting mechanism are self-cleaning, so no mud or dirt can lodge in them and the gearing in the lifting mechanism is fully enclosed so that dirt carried up by the spindle cannot get into the bearings or gears.

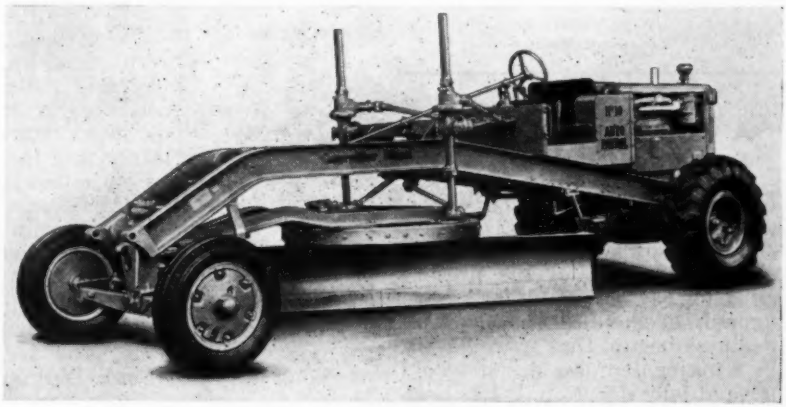
New, 1-Yard Excavator

Another modern power shovel, convertible to dragline, clamshell, crane, or dragshovel, is announced by Bucyrus-Erie Company. This new speedlined machine, known as the 29-B, is a 1-yard excavator embodying many of the new engineering features built into the recently-announced, 1 ¼-yard 33-B. In addition, the 29-B incorporates other outstanding engineering accomplishments, which have met with instant approval and success in the field, according to the manufacturer.

The 29-B is equipped with the new Bucyrus-Erie speed-type cast V-front, welded dipper; strong, light, easy-filling, quick-dumping. The patented inserted, Beco Tiger Teeth are of long-wearing, forged tool steel, quickly reversed, resharpened, or replaced. A simple, positive action, power dipper trip is standard equipment. Reinforcing diaphragms are welded into the light, all-welded boom. Strong, wide-spaced, outside handles hold the dipper firmly in digging. Extra large boom-point sheaves contribute to good digging angles and unusually long rope wear. These twin, full circle, live sheaves are 36 inches in diameter.

Other important features engineered into this machine include sturdy, single shaft drive cats giving powerful traction, facilitating easy climbing with quick, accurate steering, and allowing short or gradual turns. Swing gears and transmission boom hoist and propel are enclosed and run in oil. All high-speed shafts operate on ball or roller bearings. A fast, worm-drive boom-hoist is standard equipment, and a special independent high-speed power-up and power-down live boom hoist is also available.

Bulletin FBE 29B1 describing and illustrating these and additional features, together with detailed specifications may be obtained upon request to the Bucyrus-Erie Company, South Milwaukee, Wisconsin.



Low Pressure Tires

Caterpillar Tractor Company has now adopted the large, single, low-pressure tire as standard on its single drive No. 10 and Diesel No. 10 Auto Patrols. First showing of this new tire equipment was made at Cleveland.

Officials of the "Caterpillar" company state that long and careful experiments covering a period of more than a year have been made with the single mounted low-pressure tires in order to develop a tire of proper size, and to determine the correct inflation for best performance.

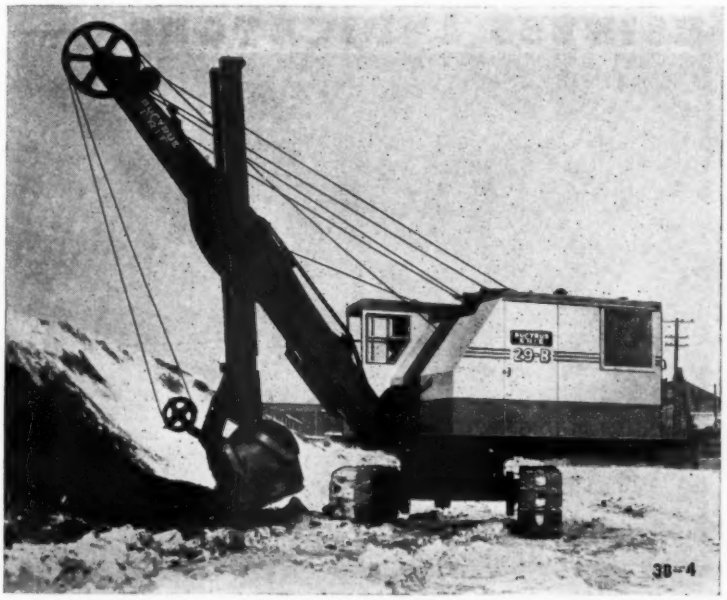
Renewable Pumping Units

Renewable pumping units having a plunger diameter from 4 mm. to 9 mm. for use in Timken Fuel Injection Pumps were shown for the first time at the S. A. E. Convention in Detroit, January 10-14.

The Timken Renewable Pumping Unit is a self-contained, accurately metered, precisely timed mechanism, according to manufacturer. It comprises in a unit body the barrel and plunger, the delivery valve and the delivery valve spring. It is held tightly in the injection pump housing by means of two hexagon nuts threaded on two studs in the pump housing, pressing against a flange on the upper end of the pumping unit body. The pumping unit is positively aligned axially in the housing by the close fit in the housing bore and by reason of one of the unit flange holes being accurately slotted to bear tightly on two sides of one dowel stud.

Thread Forging Device

A new Ingersoll-Rand development, a thread forging device for I-R Jackrods, consists of a set of blocks and a die used in connection with the I-R sharpener. This produces a thread which, it is claimed, is tougher and more resistant to drilling shock and also reduces the time consumed in the operation. Approximately five hours required for annealing machined threads is eliminated by this forging method. The manufacturers estimate 20 rods per hour can be rethreaded.



EXCAVATING ENGINEER

FOUNDED 1905

A Monthly Publication Devoted to the Excavating Industry

The Excavating Engineer Publishing Co.
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A Platform for Recovery

Expert economists, business forecasters and industrial executives seem pretty well agreed that our recession is not caused by the economic factors of the present situation. Further, they have agreed, ever since the drop in business began, that it would not be a major depression, nor would it be of long duration. It has been increasingly evident that political policies, existing and future, are now the only brakes retarding business progress.

In connection with the present fear psychology, it might be well to remember the following story: Not long ago, a young man and an old man were seated by the stove in a country store.

"You must remember a good deal about politics in the early days," the young man said.

"Well, son, I never did take a heap of interest in politics, but I do remember the year John C. Freemont was elected President."

"Freemont? Why, he was never President!"

"No? Well now, that sure beats me! Just 'fore election I heard a real famous speaker down to the city. He said the country'd fall to rack'n ruin if Freemont weren't elected. Never did check up, but the country seemed to be goin' along all right, so I kind of figgered Freemont must of won."

If we are to have a sound understanding of the present situation, and a constructive program for improving it, we should start with the basic certainty that this country of ours has too much in the way of resourcefulness and resources to "fall to rack 'n ruin" whoever may be in the chief executive's chair.

The first step in overcoming any problem is the certainty that the job can be done. The tremendous advances our country has made in science, industry, in every field of human endeavor, are ample evidence that we have never lacked that certainty. As a matter of fact we have even had too much self-confidence at times.

Given confidence that the present business situation will be solved, we can proceed to find the way to do it—without being licked by fear before we start. The problem is obviously a big one; it is equally obvious that it cannot be solved by sitting back and shivering, doing nothing but squeezing our pocketbooks. The more we retrench, the worse the situation is bound to become. The years following 1929 should have taught us that.

Also, because the problem is a big one, we must realize that we may make mistakes trying to overcome it. We must be willing to admit those mistakes, write 'em off the books and start in again. If we don't, real progress is impossible.

How do we, as a country, stack up on the three recovery "planks" just outlined?

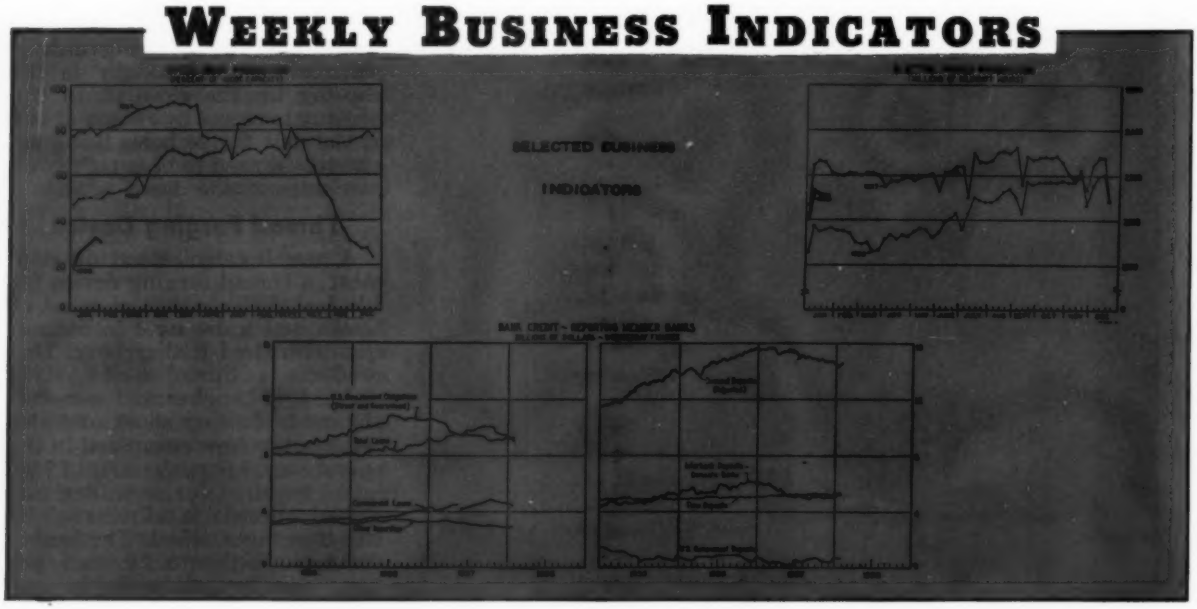
Right now, we're low on confidence.

We're too inclined to sit tight, do nothing, or to retrench.

As a country, we're willing to admit we've made mistakes, but our administration is not. Any of us hate to be wrong, hate even more to have to admit it. But we do have to admit it, at least to the extent of correcting the errors, or we don't last long. The very nature of their jobs makes it especially difficult for politicians to admit mistakes. But with government growing constantly more powerful, it is increasingly vital that errors be recognized and remedied, even at the cost of coming right out and admitting them.

To convince our present federal administration of this is difficult,

WEEKLY BUSINESS INDICATORS



before election time, as the tendency seems to be to listen only to evidence pointing toward desired conclusions. In the case of the present recession it is too easy to blame business for a condition so contrary to its own interests that it is the last thing business desires. Such dramatic examples as the recent conference of small businessmen at Washington, however, should have their effect. One reason it has been possible to set business up as a whipping boy is the difficulty of presenting the case for business in a dramatic way. Common sense has little emotional fire, but we must have it in order to exist, let alone to progress.

Speaking at the recent Convention and Road Show in Cleveland, Wm. H. Parrish, President of the Manufacturers' Division of the American Road Builders' Association, and sales executive for International Harvester, put the possibilities of the year ahead extremely well. He said, in part:

"The quality and size of this year's show and the enthusiasm we have put into it speak eloquently of our faith in our own industry and its prospects for 1938. . . . In my opinion we as an industry have good reason to look forward with optimism. . . . However, if the coming year is to equal or better last year . . . it will require a great deal more effort on our part. . . .

"Our job in the coming 12 months, as I see it, will be primarily a job of selling. The sales are there for us, but we will have to work considerably harder to get them. . . .

". . . it is self-evident that sales resistance will be stronger this year, but it appears to me that it will be a psychological sales resistance rather than a lack of desire for our products or ability to buy them."

Directed to suppliers for the nation's number 2 industry, Construction, Mr. Parrish's remarks can well be applied to those of us who don't have machinery to sell, can be applied to all industry, and to its job in selling not only its services and products, but itself as well.

Business, political cooperation, the solution of our economic difficulties, they may be hard to get, but they are there—let's go after 'em!

Men and Machines

(*Continued from page 152*)

District took over in 1935 was 281, or 86 per cent above the state average. Under District control the rate was gradually decreased until for 1936 it was 92. It further declined during 1937, and in July, the month just previous to the strike, it stood at 83. This was the enviable record that had to be maintained with reorganized crews. There was plenty of good opinion, besides that of the strike leaders, that it couldn't be done.

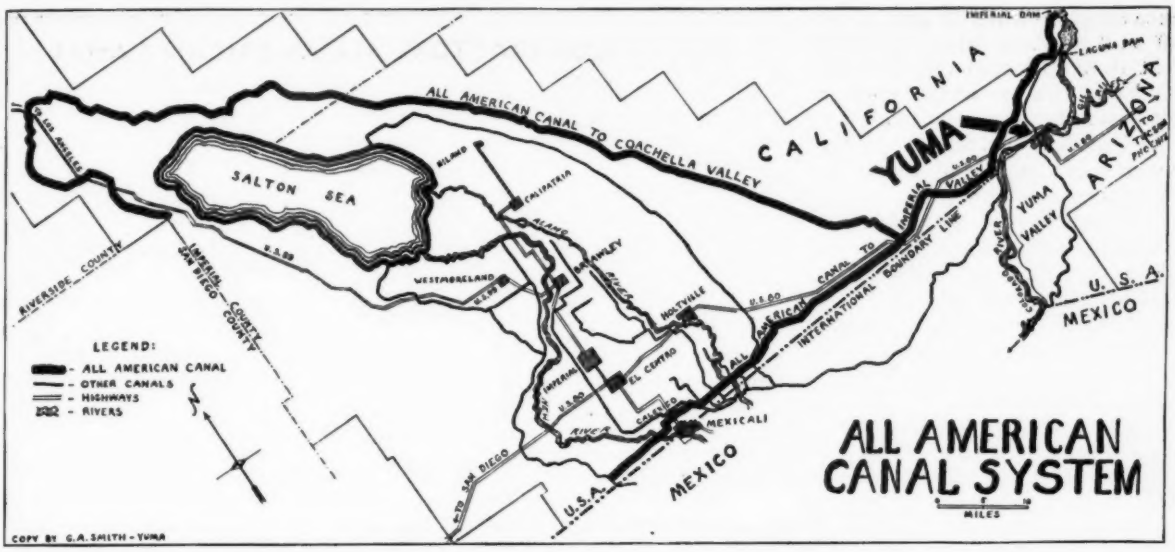
Accident Frequency Drops with New Crew

It was not only maintained, but lowered. The frequency for September, the first complete month after the strike, was 58. The number of men working does not effect the rate, as frequencies are based on the number of lost-time accidents per million man-hours worked. While the report for October is not yet available as this is written, the tendency has been constantly downward, and preliminary figures point to a still further decrease. In any case, there is no doubt whatever that safe working conditions have been maintained.

The whole story, both of safety and efficiency, hinges on modern equipment. The aqueduct has been built largely by men previously inexperienced in handling heavy machinery. Residence restrictions made it necessary to recruit the forces from within the District, and especially in the case of the tunnel workers barely enough experienced men were available to form skeleton crews. Students, laborers, teachers, clerks—jobless men from all walks of life were hired and carefully trained in the use of completely unfamiliar machines. Every effort was made to insure that this training be thorough and correct. It is often difficult if not impossible to teach an old dog new tricks, and these green men had at least the advantage of having no faults to unlearn. The fact that they could be trained well enough to carry forward the construction of the world's greatest length of tunnels practically to completion, and the whole gigantic project to within 30 per cent of the finish in the short span of 5 years; to shatter one record after another in all phases of the work, and to do it with a safety seldom before attained on a similar job, all indicates machines easy and safe to operate.

There was nothing new or unpredictable in the results at San Jacinto tunnel. Aqueduct engineers, who knew and understood the elements involved, were never in doubt as to the outcome as far as progress was concerned.

The importance of the incident lies in the graphic drama of men versus equipment, and the clarity with which the role of the latter is brought out.



All-American Canal

a Summary

By JOS. C. COYLE

ALTHOUGH final wind-up of construction work on the All-American Canal will not come until about June, 1939, excavation is nearly completed now, and nearly all major features of the project are under contract. Imperial Dam, at the head of the giant irrigation system is 85 per cent completed at the present writing. Only 105,000 yards remain to be excavated under present contracts, and the chief digging problems, such as heat and blow-sand, have been overcome.

Total excavation for the canal itself tops 57,000,000 cubic yards, with about 3,000,000 yards more required in connection with the various structures. Early stages of the project, together with the topography of the region and history of irrigation in Imperial Valley, were described in the August, 1935 issue of Excavating Engineer. The object of this article is to draw a brief picture of the job as it stands today.

● On the opposite page are three Spence Air Photos showing typical canal excavation scenes. Top and bottom views are big dragline operations. The center picture shows construction of a wash siphon.

At Imperial Dam, pouring concrete in the 1,200-foot overflow section was started in September, 1937, by Morrison-Utah-Winston Company, following diversion of the river through gate structures at the Arizona abutment. The new construction area was dewatered on the downstream side with deep well pumps ranging up to 14-inch, and on the upstream side by numerous well point pumps. Following excavation by draglines, the site of the overflow section was partly backfilled with selected material, and compacted to form a sub-base for the structure. Concrete was pumped from a plant at the Arizona end, and distributed to the forms through articulated metal chutes and elephant trunks. Concrete for minor jobs was carried from plant to job in truck mixers. Excavation and embankments for the desilting basins and for the canal down to station 50, was handled under subcontract by the George W. Condon Company.

Canal Construction

From station 50 down to 245 construction of the canal was contracted by the George W. Pollock Company, of Sacramento, for a total of $700,987.70. Schedule 1, beginning at station 50 and consisting of 931,000 cubic yards of common, was excavated by W. E. Callahan Construction Company and Gunther & Shirley by a mutual arrangement with Pollock, using a walking dragline. Below this, the canal is carried behind a compacted embankment for 8,200 linear feet on schedule 2. This section was subbed to Lewis Construction Company, of Los Angeles. At the lower end of this schedule a rock cut 1,700 feet long was reserved by the Pollock Company.

The compacted embankment mentioned is 144 feet wide at the bottom, 27 feet at the top and is 26 feet high. A cut-off trench was

excavated beneath it and a cut-off wall of sheet piling driven 30 feet deep. Selected material was hauled from a pre-watered borrow pit two miles from the job.

A smooth surfaced road was constructed into and along the canal from the borrow pit, and the trucks traveled at 30 to 35 miles per hour each way, entering the fill at slow speed over dirt ramps. Outside traffic was excluded from this road. The earth was dumped in windrows and spread with bulldozers to 6 inches in depth. Rocks over 5 inches thick were removed, partly by a screen at the borrow pit and partly with a specially constructed rock picker at the fill. The layers of earth were compacted several times with tandem sheepsfoot rollers, and additional water required was sprinkled on from a 700-gallon tank truck. There are 691,000 cubic yards in the fill, the inner slope of which is blanketed with 12 inches of selected pit run gravel, amounting to 17,400 cubic yards.

The outside slope was blanketed by Pollock, with 250,000 cubic yards of rock from the big cut. This has a bottom width of 94 feet and a maximum depth of 86 feet. It was removed in 30 foot lifts, using a wagon drill in the main section and fourteen jackhammers near the slopes. Jackhammer drilling reached a maximum depth of 22 feet. The deeper holes were sprung three times, using from one to five cases of stick powder, and as many as 18 cases of explosive were used to load. T.N.T. (from government stock) was used to break the hardest rock, B.B. black powder in the softer areas. 40 per cent gelatin stick was used in a wet area near the east end of the cut. An average of about ¾-pound per cubic yard was used on the job. A stationary compressor, installed at the shop on the east end of the cut, furnished air, supplemented by a portable unit. The latter also supplied air to the jackhammers while drilling a number of rocky points which jutted into the canal section just east of the cut portal.

Thirty Mile Contract

Six schedules of canal excavation, 245 to 1860, were contracted by the W. E. Callahan Construction Company and Gunther &

LIST OF CONTRACTORS ALL-AMERICAN CANAL

Contractors & No. of Specifications	Stations Numbers		Cu. Yards Excavated	Amount
Spec. 647	50 to 245	Sched. 1 Common	931,000	$ 71,407.70
Geo. Pollock Co.,		(Ex. by Callahan for Pollock)		
Schedules 1 and 2		Sched. 2 Rock	542,000	216,800.00
		Common	141,000	21,150.00
		Strip for embmt	97,000	19,400.00
		Cut off trench	25,200	5,040.00
(Subbed to Lewis Cons. Co.) Los Angeles		Compacted embkmt	691,000	255,670.00
		Gravel blanket on inner slope	17,400	13,920.00
	Excavation	Cu. Yards	1,903,600	$603,387.70
		Haul and place rock blanket outer slope Sta. yds.	8,000,000	$40,000.00
		Make and drive wood piles Bd. ft.	1,440	57,600.00
		Total Contract price		$700,987.70

ORIGINAL CALLAHAN G. S. CONTRACT
APPROXIMATE 30 MILES OF CANAL

Spec. 573 SIX SCHEDULES

W. E. Callahan Cons. Co., & Gunther & Shirley

Canal excavation

Stations 245 to 1860

Sched. 1 Sta. 245 to 537.

Item 1. Sta. 245 to 324	Common	1,290,000	1,307,000	158,025.00
Item 2. Sta. 324 to 537	Common	4,225,000	4,470,000	517,562.50
Item 3. Sta. 245 to 537	Rock	10,000	122,000	12,500.00
Item 4. Yuma Canal detour channel at	Potholes Common	34,000		8,500.00
Item 5. Yuma Canal detour channel at	Potholes Rock	13,000	27,000 (Excavation, especially rock, exceeded estimates on Sched. 1)	16,250.00
Sched. 2. Item 6. Sta. 537 to 800	Common		5,800,000	710,500.00
Sched. 3. Item 7. Sta. 800 to 1089	Common		6,100,000	747,250.00

(Sublet by Callahan & G. S. to Boyce & Igo Construction Company)

Sched. 4. Item 8. Sta. 1089 to 1400, except Griffith's schedule 7 at Pilot Knob	Common		7,150,000	875,875.00

Spec. 695

Callahan Co. and Gunther & Shirley

Sched. 4. Item 9. Sta. 1089 to 1400	Rock		5,000	$ 6,250.00
Sched. 5. Item 10. Sta. 1400 to 1625	Common (Sand dunes)		7,650,000	937,125.00
Sched. 6. Item 11. Sta. 1625 to 1860	Common (Sand dunes)		7,100,000	869,750.00
	Common		39,354,000	
	Rock		28,000	
	Excavation total, Cu. Yd.		39,382,000	Contract Price $4,854,587.50

TWO ROCK CUTS AT PILOT KNOB

Spec. 573.

Griffith Company

Sched. 7. Item 12. Sta. 1140′-50 to 1148′-50	Common	40,000	16,800
Item 13. Sta. 1161′-0 to 1170′-50	Rock	500,000	210,000
	Excavation total	540,000	$ 226,800
Spec. 810-D. V. R. Dennis, San Diego. Cu. Yd., all classes $32,500	Widen rock slopes, 1161′-75 to 1170′-25.	50,000	

Spec. 621

Lewis-Chambers Cons. Co.

Schedules 1, 2, and 3

Sched. 1. Sta. 1860 to 2170	Common	2,707,000	
Sched. 2. Sta. 2170 to 2455	Common	2,564,000	
Sched. 3. Sta. 2455 to 2740	Common	2,518,000	Contract Price
	Excavation, Total	7,789,000	$505,506.00

LIST OF CONTRACTORS ALL-AMERICAN CANAL

Contractors & No. of Specifications	Stations Numbers	Cu. Yards Excavated	Amount
Spec. 621.			
Mittry Brothers			
Sched. 4.	Sta. 2740 to 3090'-75.....Common.....	3,472,000	$260,400.00
	(Sub-contracted to W. E. Callahan Co., and Gunther & Shirley)		
	Sta. 3090'-75 to 3325		Excavated by
	And Sta. 3338'-50 to 4200.....	3,825,000	Govern't forces
Spec. 386	Canal Excavation, and detour at		Contract Price
Peterson Cons. Co., Minneapolis	turnout of central main canal, Sta. 3325 to 3338'-50.....	748,000	$54,862.50

CONTRACTS FOR STRUCTURES

Spec. 645. Frazier-Davis St. Louis	Four wash siphons at 120, 124, Unnamed, and Picacho washes. Contract price	$ 489,527.50
	Total excavation 366,850 Cu. Yd.	$ 98,195.00
Spec. 684. Peterson Cons. Co.	Six schedules—Wash overchutes, drainage inlets, turnouts Sta. 308 to 1122	
	Contract price	$ 351,047.00
	Total excavation 308,850 Cu. Yd.	$ 75,485.00
Spec. 665. David H. Ryan	Item 1. Railroad bridge, Sta. 1029. Contract price	$ 42,390.00
	Item 2. Highway bridge, Sta. 1035. Contract price (subbed to Zimmerman & Guager, except exc. and piling)	$ 29,240.00
	Item 3. Wash overchute, Sta. 1042. Contract price (subbed to Brock & Clark, Except excavation and piling)	$ 83,817.00
	Excavation by Ryan for structures, overchute channels and dikes and canal plugs, all three items. 56,200 Cu. Yd.	$ 12,205.00
Spec. 713. Lewis-Chambers	Four highway siphons	
	Contract price	$ 106,528.50
	Excavation 37,400 Cu. Yd.	7,480.00
Spec. 728. Bennet & Taylor	STRUCTURES Sta. 3825'-80 to 4242'-85. 14,500 Cu. Yd. Contract price	$ 64,425.40
	Excavation	7,250.00
Spec. 724. Sharp & Fellows	New river crossing and other structures Schedules 1 and 2	
	Contract price	$ 269,721.20
	Excavation 93,000 Cu. Yd.	$ 27,791.00

TWO HIGHWAY BRIDGES

Spec. 717 Lewis-Chambers	Sta. 1635. Contract price	$ 51,272.00
	Excavation 9,400 Cu. Yd.	$ 2,820.00
	Sta. 1930. Contract price	$ 22,896.00
	Excavation for canal 29,200 Cu. Yd.	660.00
	Excavation for structure 3,300 Cu. Yd.	2,336.00

CONTRACTS FOR EARTH LINING IN CANAL

Spec. 695. A. S. Vinnel Co., Alhambra, Calif.	Sta. 51-50 to 691-46. Contract price	$ 147,462.00
	Compacted 243,000 Cu. Yd.	$ 136,192.00
	Uncompacted 64,400 Cu. Yd.	11,270.00
	Total 307,400 Cu. Yd.	$ 147,462.00
Spec. 695. Geo. Pollock	Sta. 606'-75 to 783'-75. Contract price	$ 121,925.00
	Compacted 215,000 Cu. Yd.	$ 111,800.00
	Uncompacted 45,000 Cu. Yd.	$ 10,125.00
	Total 260,000 Cu. Yd.	$ 121,925.00
Spec. 668 David H. Ryan	Contract price	$ 99,150.00
	Sta. 419 to 601	
Sched. 1.	Compacted 134,000 Cu. Yd.	$ 44,220.00
	Uncompact 49,000 Cu. Yd.	11,760.00
	Sta. 803 to 1245	
Sched. 2.	Compacted 91,000 Cu. Yd.	35,490.00
	Uncompact 32,000 Cu. Yd.	7,680.00
	Total 306,000 Cu. Yd.	$ 99,150.00

CONCRETE AGGREGATES FOR CANAL & DAM

Spec. 633. Triangle Sand & Gravel Co. & Chas. Holmes	320,000 Cu. Yd. Contract price	$ 149,900.00

Shirley for a total bid of $4,854,587.50. Total excavation was originally estimated at 39,382,000 cu. yds. However, when the contract was only 97.7 per cent completed, 39,581,398 cubic yards had been removed. This includes schedule 3, station 800 to 1089, consisting of 6,100,000 cubic yards which was subbed to Boyce & Igo Construction Company. The Callahan contract was also broken by schedule 7—the Griffith rock cuts—at Pilot Knob. The company has also excavated 3,543,179 cubic yards from station 2740 to 3090-'75, on subcontract from Mittry Brothers, who took the job for $260,400. Four walking draglines have handled most of the excavation, supplemented by two small rigs, used largely in finishing. Three other small draglines were also used early in construction.

Hard digging has been the lot of the Callahan draglines working on the eastern end of the contract, near Potholes, and Laguna dam. Hard rock was encountered in places, enormous boulders, cemented in place, at others. From station 245 to 537 tough work has been the rule. Having excavated schedule 2, which was mostly common, the machines moved across schedule 1 toward Laguna dam, stripping as much as possible off the surface of the rock ridges and filling in washes to make a construction road as they went.

Near Laguna dam the new canal overlapped a section of the old Yuma canal, and part of the Callahan job was to excavate a new channel for the latter, involving 34,000 cubic yards of common and 27,000 cubic yards of rock excavation. A wagon drill and some jackhammers were used in drilling the rock section. This was blasted and the water turned off in the Yuma canal. The big walking dragline quickly dropped an embankment across the canal and walked across. The detour channel was scooped out and two machines proceeded to excavate the 391,000 cubic yards for Pollock, mentioned before.

Meanwhile a stationary compressor, driven by a vee belt from a 200 h.p. motor, together with a 4 by 20 foot storage tank, was set up midway in the two mile canal section to be blasted. A spe-

(Continued on page 180)

Field NOTES

Broken Bones

Setting a broken bone so that it will grow together and be "as good as new" calls for expert medical attention. Whenever any one has broken a bone, the doctor should be called. If he can't come, it may be necessary to take the patient to the doctor—BUT—he should not be moved until someone has applied a suitable splint or bandage. Otherwise, the pain is almost sure to be increased, and the raw edges of the broken bone may pierce or mangle the flesh, nerves, and other tissues, thus making a bad matter just that much worse.

If a bone has been fractured in the arm, wrap some newspapers around it, then tie the paper in position with strips of cloth above and below the break, and support the arm in a sling.

If the collar-bone has been broken, support the arm in a sling and fasten the sling securely to the body.

If a leg-bone has been broken, try to get two boards, each about 3½ inches wide. Put one board on the OUTSIDE of the leg and the other on the inside. If the break is below the knee, both boards should extend above the knee. If the break is above the knee, the outside board should extend up to the armpit, and the inside board up to the crotch between the legs. Place padding between the leg and the boards, then fasten the boards in position with pieces of cloth.

If a kneecap has been broken, place a board UNDER the leg from foot to hip; then use pieces of cloth to secure the board in position.

If the head has been injured, and if the person is unconscious, place him flat on his back with the head slightly raised. Loosen his clothing and cover him to keep him warm. If blood is flowing from an open wound in the head, stop the bleeding. If blood oozes from the mouth, ears, nose or eyes, turn the head so the bleeding side is down—and get a doctor quickly!

If breathing is difficult or painful, it is likely that the patient has one or more broken ribs that may have punctured the lungs or other internal organs. In such a case, it is best not to move him unless absolutely necessary.

A compound fracture is one in which a broken bone breaks through the skin. If the wound is bleeding, stop the flow of blood, and then cover with a sterile dressing. Do not move the patient. He needs expert medical attention.

—National Safety Council

Welder's Tool Tray

The welder's tool box should provide safe storage for a variety of cutting and welding tips. The tray shown here, for a 12 by 12 by 24 inch metal box (over all measure) is easily fitted up. The welding tips are clamped between two ½ by 4 inch pieces of hard rubber, fiber or wood, with the bottom member bolted to the tray and the top section hinged with small flat hinges and held at the open end by a small spring catch which fits into a recess in the tray edge. They are placed crosswise of the tray, the one holding small tips leaving room for a third holder for cutting tips to be hinged lengthwise to the tray.

This holder is either solid, or two piece bolted together, and the tips inserted in the edge. Felt, glued to the tray, protects the delicate end of the tips from damage. The tray is hinged to the box lid with a ¼ inch rod through its back corner. The front edge is provided with a spring catch fitting into the box edge, when box is closed. A false bottom in this box also provides storage for an emergency assortment of rod, to be carried at all times.

—Joseph C. Coyle

"Speak Now or Forever Hold Your Peace"

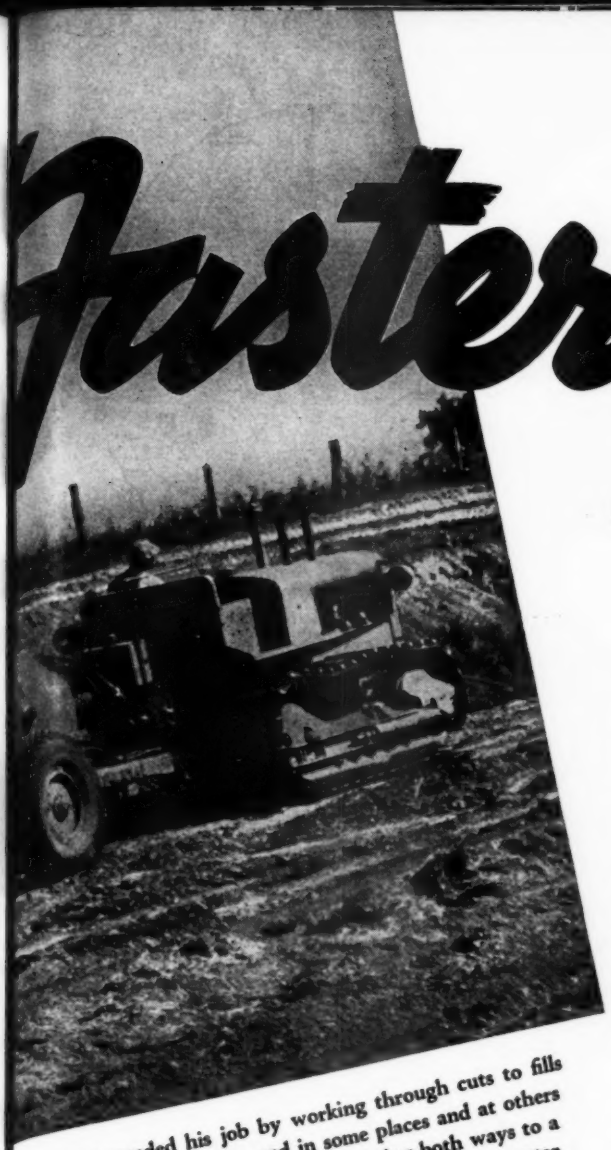
A contractor or subcontractor who intends to stand on a claim of right to extra compensation for work required of him by the other party, as part of the original contract undertaking, should leave no room for doubt on that point when he does the work. Otherwise, he may find himself in a legal hole like that in which a dredging subcontractor found himself in the case of United Dredging Co. v. United States, 81 Fed. 2d, 118, decided by the United States Circuit Court of Appeals, Sixth Circuit.

After controversy as to whether it was the contractor's or the subcontractor's duty to remove rock and ledges from the bottom of a channel dredged by the subcontractor, the subcontractor did the work without protest and made no claim for extra compensation until more than a year after the job was completed. Denying the subcontractor extra compensation, the Court of Appeals said, in part:

"If" the subcontractor "felt that" the contractor's "interpretation of the contract was wrong, it had the right to refuse to accede to the insistence and to sue for the amount due it for work already performed. Instead of pursuing that course, it yielded and voluntarily did the work. * * * Whatever its purposes might have been, it certainly did nothing, * * * to put the" contractor "on notice that it expected to be paid beyond the contract price. Its secret intention to charge extra for the work, if it had such intention, cannot give rise to an implied promise on the part of the" contractor "to pay, for an implied promise must arise from a purpose made manifest to and acquiesced in by the one to whom it is charged."

—Arthur L. H. Street.

Faster Power



Harrison speeded his job by working through cuts to fills at either end in some places and at others by cutting both ways to a fill in the center

When Harrison Engineering and Construction Corp., began the job August 30 of realigning and paving 7.9 miles of State Route 64 near Maquoketa, Iowa, *fast work* was necessary. The project called for 171,000 cu. yds. of excavation. It was planned to have half of that and 3 miles of paving completed before the winter shutdown. To meet this schedule Harrison put three Allis-Chalmers tractors—***Faster Power***—on the job. Much of the excavating was in the black top and compacted gravel of the old road, but A-C's reserve lugging power quickly put full loads in the Continental scrapers—scarifying was unnecessary. ***Faster Power*** in the higher working speeds shortened the time between cut and fill, enabled Harrison's rigs to make many extra trips each shift. A-C's easy maneuverability and the end dumping of the scrapers made possible important savings in backfilling around culverts and in other tight spots. By Thanksgiving, when winter forced a shutdown, Harrison had graded 5½ miles and was well ahead of the planned schedule ... thanks to A-C's ***Faster Power.***

Many other contractors, like Harrison, are finding that ***Faster Power*** saves them time and increases output from start to finish. Their A-C tractors start instantly and go right to work—no fussing with or waiting on auxiliary motors. Their equipment moves faster because A-C tractors have more and higher speeds—that means greater flexibility and the right speed for every task. They move bigger yardages per horse power because A-C design eliminates speed-robbing dead weight. They gain extra trips hourly because A-C tractors move faster in the higher speeds at which 90% of all construction is done. Shift your job into high with ***Faster Power.***

ASK YOUR NEAREST A-C DEALER TO SHOW YOU WHAT *Faster Power* CAN DO FOR YOU.

ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U. S. A.

EX-LAFFS

BY J. A. PATTERSON

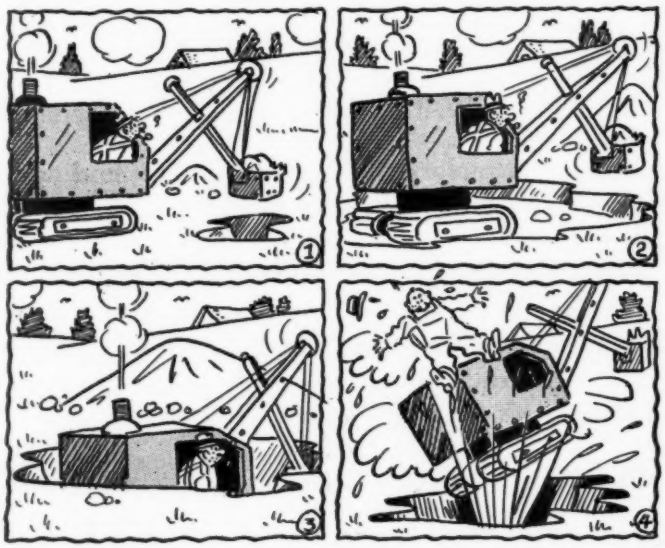
"I make it a point never to be late for work sir!"

"Okey Dokey, Mithter Joneth, we're all that for blathting!"

"Here is the government's check for $17,565.39 allotted for your homesite gentlemen, is that Okay?"

"You been gyped General; these ain't tanks!"

"Mister, I got two hundred men on this job — how can I tell which one he looks like?"



BUCYRUS-ERIE

10-B—FOR PLENTY OF "UMPH!"

THERE are no "measuring sticks" for the Bucyrus-Erie 10-B, because never before has there been an excavator in the ⅜-yard field with the tractor-like mobility, the high-speed digging cycle . . . the hard-digging, fast-moving "UMPH!" . . . to compare with this compact, go-getting piece of excavating dynamite. Year after year it has held world leadership as the fastest selling excavator. Investigate this ⅜-yard winner — it gives you more for your money — it earns more money for you!

BUCYRUS ERIE

BUCYRUS-ERIE CO., SOUTH MILWAUKEE, WIS., U. S. A.

Excavating, Drilling, and Material Handling Equipment

Shots from the FIRING LINE

Contract Awarded for Grand Coulee Completion

Formal award of the contract for completion of Grand Coulee Dam to the Interior Construction Company on its bid of $34,442,240 has been announced. Four years will be allowed for completion of the contract, which calls for building the dam to a height of 553 feet, construction of the power house on the west side of the Columbia River at the toe of the dam, and completion of appurtenant works.

A total placement of 5,250,000 cubic yards of concrete will be necessary. About 160,000,000 pounds of steel, 10,000,000 pounds of pipe and fittings, 50,000,000 pounds of gates and operating machines, 24,000,000 pounds of trashrack metal work, and 16,000,000 pounds of penstock will also be required.

Work on the first Grand Coulee contract was begun by the M.W.A.K. forces on September 28, 1934, and the final concrete pour was made on January 10, 1938, over 15 months ahead of schedule. Under this contract, the dam was raised to a height of 177 feet.

The completed dam will create a 10,000,000 acre-foot reservoir, 151 miles long; will aid flood control and navigation; permit irrigation of 1,200,000 acres; ;and generation of 2,700,000 h.p. of electric energy.

Work on the new contract will get under way at an early day.

Buenos Aires Super Avenue

The new Avenida 9 de Julio which, when completed, will be the widest street in the world, is rapidly taking definite shape. The new avenue will measure 460 feet from curb to curb and when completed will be 25 blocks long, running in a north and south direction across the downtown section of the city. The present section under construction is 5 blocks long. The size of the project is realized when it is taken into consideration that the width of the evenue includes two adjacent streets and all of the ground in the block between these streets; every building between the two streets having been razed to the ground. In other words, the avenue will be one block wide.

The central lane will be 92 feet wide. On either side of this lane there will be a safety zone 8 feet wide and on either side of these safety zones will be another traffic lane 28 feet wide. Between these outer lanes and the two present streets which will form the extreme boundaries of the avenue there will be gardens. Adjoining the garden plots and completing the width of the avenue will be the two streets already in existence and measuring 28 feet wide each. The sidewalks will be 28 feet wide also.

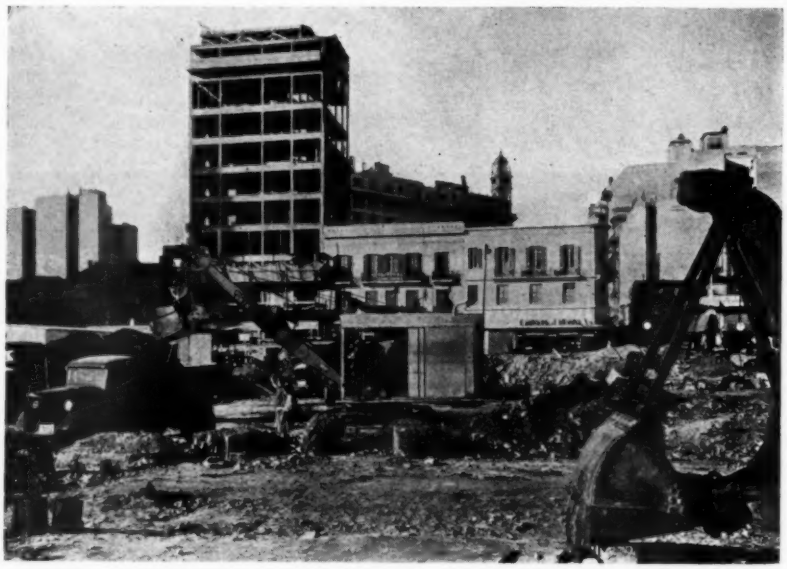
Subterranean passages at regular intervals will permit pedestrians to pass under the avenue. These passages will be lined with shops and display windows.

A gigantic subterranean garage will extend under the entire length of the avenue and is expected eventually to solve the downtown parking problem. This garage will be entered by 52 feet wide driveways. The garage is surrounded by large air ducts with extractors for drawing off fumes and impure air. There will be a telephone and loudspeaker system for paging the chauffers of the cars.

A number of difficulties were encountered in the excavation of this avenue not the least of which were the large number of disused sanitary and water wells. All of these wells were filled with concrete to prevent future cave-ins.

Siemens Bauunion have the municipal contract for this job and have sub-let various parts to a number of local contracting and construction firms. The engineer in charge for Siemens is Ing. Hermann and Ing. Frederico Zamboni is in charge for the Municipality.

The 9 de Julio project is to cost 5,000,000 pesos for the construction only, in addition to the demolition and ejection costs and at present is providing work for 1,400 men.



● Here is part of the excavation work on the new Avenida 9 du Julio in Buenos Aires. The ½-yard shovel belongs to Luis Boxzini e Hijo, one of the contractors on the job. Another picture of this "Avenida" appeared in our January issue.

New Mississippi Road Program

A bill passed by the Mississippi legislature provides $40,000,000 for new road construction to continue the work started under last year's $42,000,000 program.

Funds are to be provided by a $60,000,000 bond issue, $20,000,000 of which will be used to refund bonds issued as part of the program last year.

Congress Gets Report On Highway Accidents

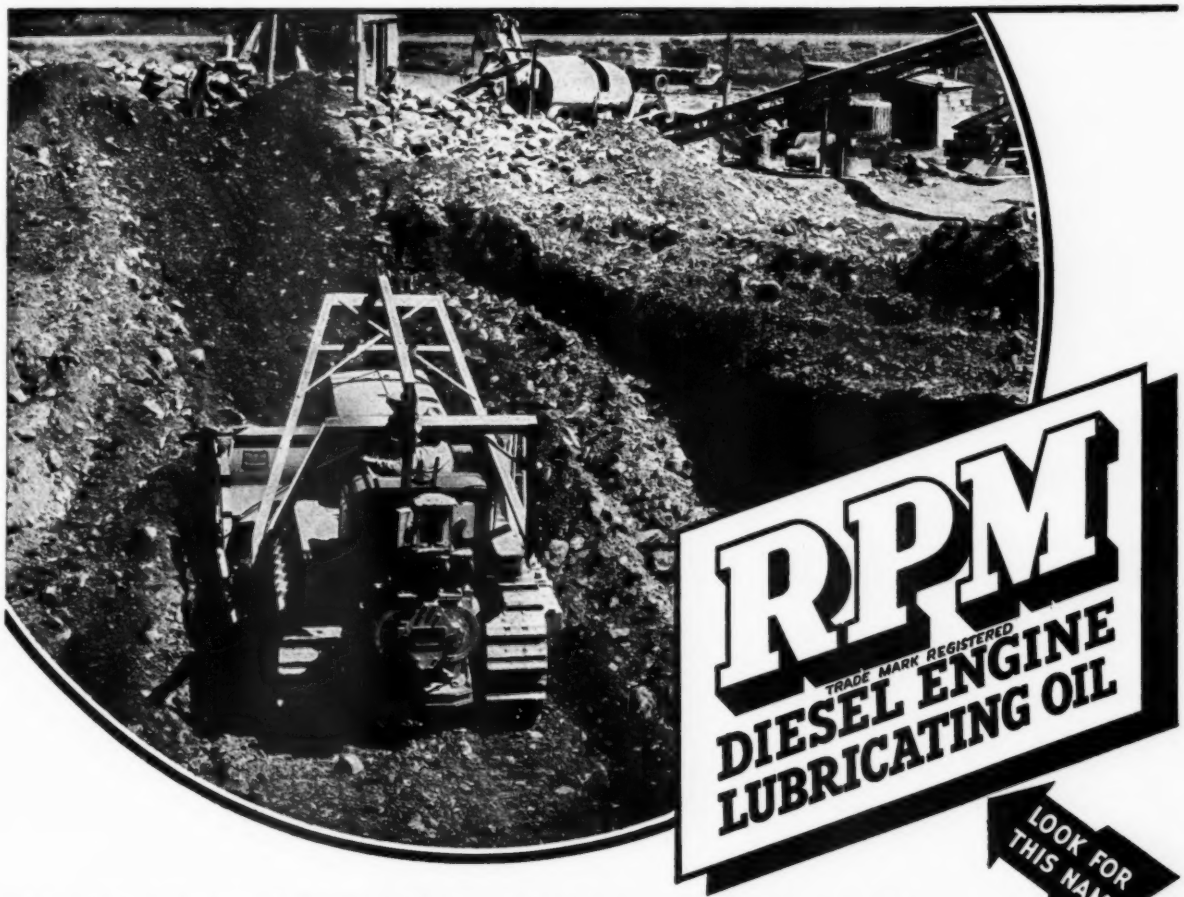
Measures recommended to reduce the highway accident toll are described in a report made to Congress by the Bureau of Public Roads. The report, based on extensive field studies, is published in six parts as House Document No. 462, Parts 1 to 6, and covers the following subjects:

Part 1 presents a picture of the basic differences in traffic laws in the various States. Drivers passing from State to State are subject to varying road rules, control devices and laws, which they are apt to violate through sheer ignorance, the reports says, "for no human being can memorize differing rules for 48 States."

For the same offense a driver may go practically "scot-free" in one State and be imprisoned for years in another, showing the injustice or ineffectiveness of different traffic laws. For instance, a drunken driver causing death may be punished in different States anywhere from 30 days to 20 years in prison.

Part 2 shows the dire need of analyzing accident causes in order to prevent

More "RPM" Diesel Engine Lubricating Oil is being sold and used in "Caterpillar" Diesel Engines than all other Diesel oils combined



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● Here's a heavy moving job. A Bessemer & Lake Erie Railroad Bucyrus-Erie railroad crane is moving a Cooper-Bessemer 930 h.p., 6-cylinder Diesel engine. The engine is being moved from the Cooper-Bessemer factory to the Grove City Bureau Municipal Electric plant.

future accidents, and the importance of studying physical aspects of a case before evidence is destroyed. The difficulties of investigating accidents immediately, particularly in rural areas, are outlined, together with a description of methods used by trained accident investigators.

Factors contributing to motor-vehicle accidents are given in full, together with illustrative cases.

Part 3 pictures the variations and inadequacies of motor-vehicle accident reporting throughout the United States. Of the 48 States, only 15 require accidents to be reported immediately to a central State agency, 19 have no central control, and 14 require no report.

A study of accurate, thorough, and consistent accident reports would show danger spots on the highway, and most frequent causes of accidents, says the report.

Part 4, Official Inspection of Vehicles, deals with another phase of accident prevention. It is based on experience in the 15 States having State-wide, motor-vehicle periodic-inspection laws for all motor vehicles.

Part 5 presents case histories of fatal highway accidents. One example — a child, playing with the car door handle, fell headlong to the pavement. The father, rushing the child to the hospital and frantically waving his handkerchief for right of way, ran into another car, killing the child, his wife, and himself.

Part 5 analyzes the case histories of 1,715 fatal highway accidents from the 1936 official records of representative States and cities.

Part 6 discusses the accident-prone driver. The records on drivers kept by the department of motor vehicles of Connecticut were selected for study because of the carefully-kept card file which made it possible to check on accident-repeaters. The 6-year record of every tenth name in this card file—a total of 29,531 drivers—was studied and compared.

The study showed that in the general population of drivers there is a small group that is definitely accident-prone and a much larger group that is just as definitely accident-free. With the small but destructive group trained, disciplined, or removed from the highway, the accident total would be greatly decreased.

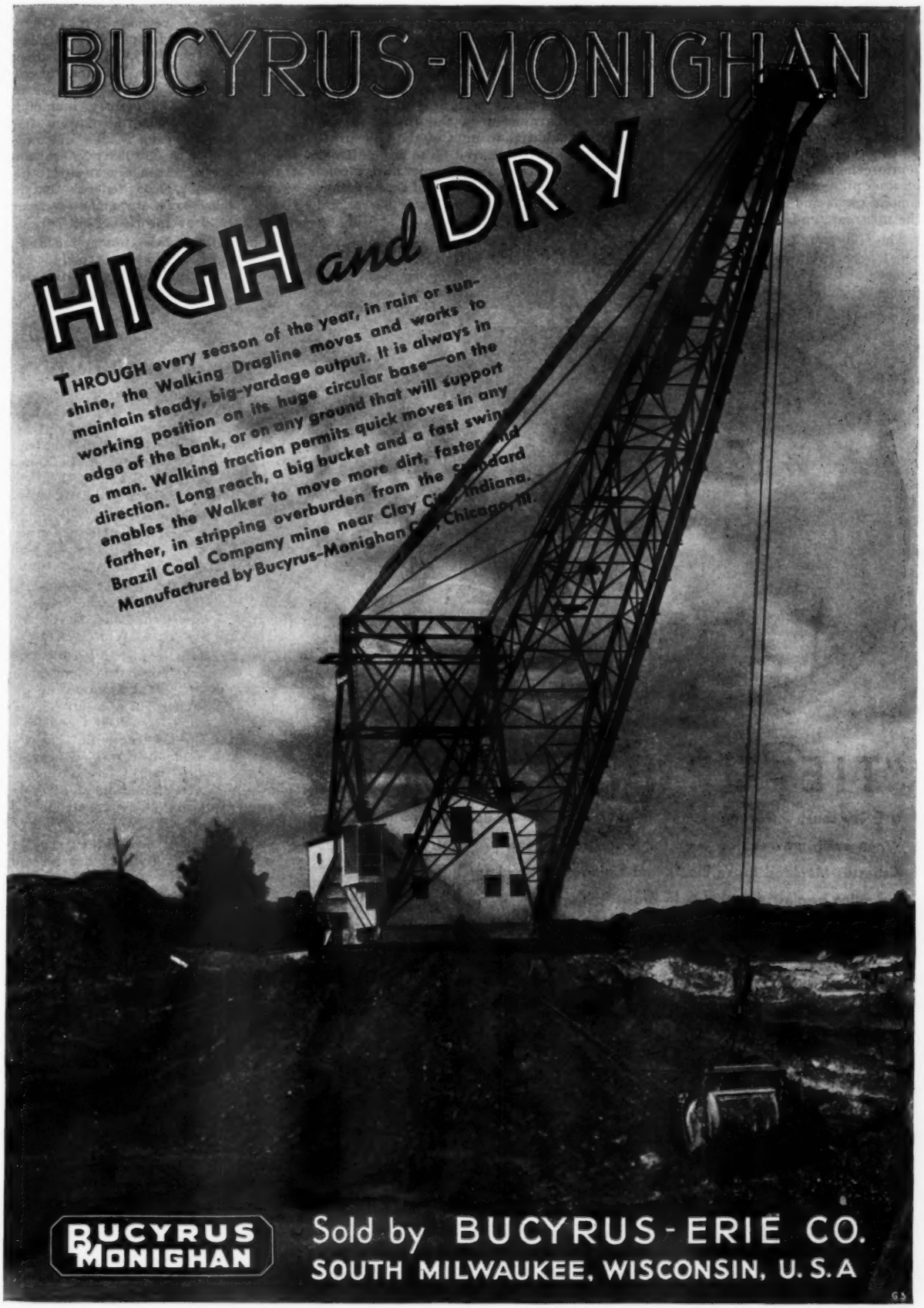
These 6 reports may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price of Part 1 is 15 cents. Parts 2, 3, 4 and 5 are 10 cents each. The price of Part 6, in course of publication will be 10 cents.

Gila River Crossing Awarded

The contract for the construction of the Gila River crossing, one of the major structures of the Gila Federal reclamation project in Arizona, has been awarded to the Metropolitan Construction Company of Los Angeles on its bid of $337,375.50. The successful bid was the lowest by more than $30,000.

The Gila River crossing, which will carry the main canal across the Gila River canyon about eleven miles west of Yuma, will consist of approaches at

● The last section of one-way road in Yellowstone National Park, Wyoming, is being eliminated here by James Crick, Washington contractor. Job pictured here involves 500,000 yards of excavation. LeTourneau 12-yard and 18-yard Caryall scrapers will handle a large part of the yardage.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HIGH and DRY
THROUGH every season of the year, in rain or sunshine, the Walking Dragline moves and works to maintain steady, big-yardage output. It is always in working position on its huge circular base—on the edge of the bank, or on any ground that will support a man. Walking traction permits quick moves in any direction. Long reach, a big bucket and a fast swing enables the Walker to move more dirt, faster and farther, in stripping overburden from the Standard Brazil Coal Company mine near Clay City, Indiana. Manufactured by Bucyrus-Monighan Co., Chicago, Ill.
BUCYRUS MONIGHAN
Sold by BUCYRUS-ERIE CO.
SOUTH MILWAUKEE, WISCONSIN, U.S.A

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either end and a syphon barrel 19 feet 6 inches in diameter and 2,120 feet long. The barrel of the syphon will be of reinforced concrete. The contract will require excavation of about 177,000 cubic yards of material, placement of 106,000 cubic yards of compacted embankment, and placement of 11,600,000 cubic yards of concrete, 2,448,000 pounds of steel reinforcement bars, and 1,768,00 pounds of steel piling, as well as installation of control gates and hoisting machinery at the upstream end of the syphon barrel.

The Gila gravity main canal is being constructed to provide water to about 150,000 acres of raw desert land in the first unit of the Gila project near Yuma. The water will be diverted from the Colorado River 300 miles below Boulder Dam at the Imperial Dam which also heads the All-American Canal in southern California. Structures on the Gila canal are being designed so as to permit enlargement in the future in the event additional units of the Gila project may be desired. The Gila River crossing, for example, in its design contemplates the possibility of construction on an additional and larger barrel for the syphon at a later date.

Heavy 1937 Motor Tax Bill

Preliminary estimates by the American Petroleum Institute show a direct automotive tax revenue for 1937 of $1,003,984,500. Principal item in this revenue is the $775,000,000 realized from state gas taxes. The federal gas tax totaled about $200,000,000; tax on lubricating oil, $33,312,000;; municipal gas tax, $5,000,000; registration fees and licenses for tank trucks and other motor vehicles, $5,500,000;; federal and state excise taxes on trucks and other vehicles, $2,650,0000; federal tax on tires, $2,200,000; federal and state taxes on parts and accessories, $322,500.

Some indirect taxes on motor users, county taxes, etc., are not included in these figures. Since approximately one dollar in six was diverted to non-highway uses, these figures indicate a 1937 diversion of more than $167,330,750.

New ARBA Officers

The following new officers were elected at the recent American Road Builders Association Convention and Road Show: Murray D. Van Wagoner, president; P. B. Reinhold. E. D. Kenna, Lion Gardiner, and Stanley Abel, vice presidents; J. H. MacDonald, treasurer.

Wm. P. McDonald and W. R. Smith were elected president and vice president, respectively, of the Highway Contractors' Division of the Association.

Directors for the next two years are: A. W. Brandt, C. W. Brown, Frederick Hoitt, C. J. Sherlock, Chas. M. Upham, C. D. Vail, and H. C. Whitehurst.

Over 27,000 delegates from all parts of the world attended the Convention, which went on record as opposing any reduction in Federal Aid, or any change in the procedure by which these funds are administered. Diversion of highway funds was condemned, and it was resolved to adopt and follow a definite plan aimed at elimination of diversion by constitutional amendment in the various states.

Safety sessions brought out the expert opinion that highway deaths could be cut in half by adequately building safety into the roads. Important points in the recommended program included construction of four-lane divided highways, straightening and banking of sharp curves, reduction of steep grades, use of guard rail on curves and bridges, elimination of grade crossings and blind intersections, construction of broad, firm shoulders, skid-proofing of all road surfaces, and provision of adequate illumination for night driving.

Bartlett-Hayward Wins Grand Coulee Gates

Secretary of the Interior Harold L. Ickes has announced award of the contract covering 41 gate frames for the penstock and outlet works at Grand Coulee Dam under construction by the Bureau of Reclamation on the Columbia River in Washington, to the Koppers Company, Bartlett-Hayward Division, Baltimore, Maryland, on its bid of

"TIE-UP Prevention"

● Every construction man knows the severe costs of tie-ups on any equipment. When earth movers stop even for brake adjustment, profits drop. But Gatke Asbestos Moulded Brake Blocks and Lining developed for this very field, are insurance against delays due to brake failures.

It is furnished in any thickness and length to meet the requirements of power shovels, hoists, cranes, drag-lines and similar equipment.

Gatke engineers will gladly cooperate. Write them today.

Gatke Double Cone Type Friction Blocks

● Gatke Asbestos Moulded Brake and Friction Blocks

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● Gatke Heavy Duty Woven Brake Lining

The originators of Moulded Automotive Brake Lining

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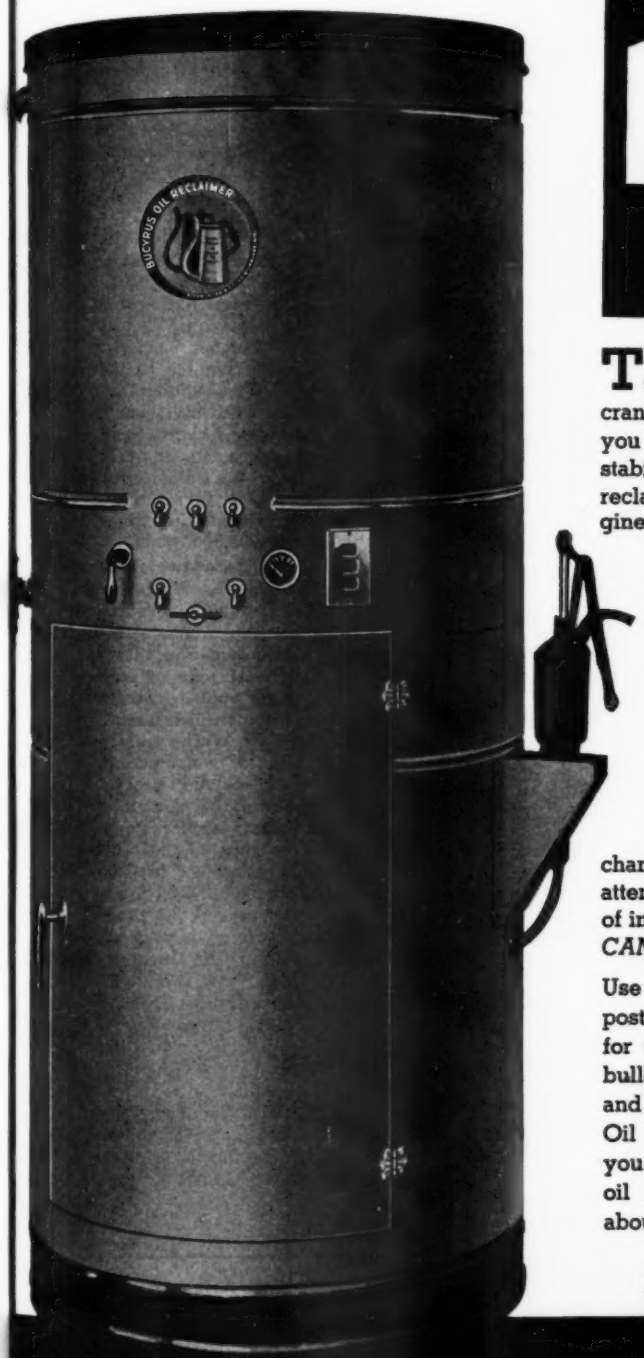
If you use lubricating oil read this

LEADING lubrication engineers have agreed for many years on the practicability and value of reclaimed oil. However, only big operators could afford the expensive distiller-type reclaimers and the full-time technicians required to operate these complicated units safely and successfully. But now there is a new, simple, safer Reclaimer that is built for YOU.

GOOD NEWS

USED CRANKCASE OIL RE-REFINED FOR ABOUT 9 CENTS PER GALLON



THE BUCYRUS OIL RECLAIMER is a reliable inexpensive unit that removes waste products and dirt from your used crank case oil by washing and filtration processes and gives you up to 90% recovery of good, clean, safe, lubricating oil, stabilized and tempered to your own engine requirements. This reclaimed oil gives you bigger gas mileage and lower engine maintenance *(plus lower lubricating costs)* because the unstable molecules have been broken down in your engine by friction and heat and are removed by the Reclaimer. Only the strongest molecules, rich in lubricating qualities, are left.

This new Reclaimer can be delivered on your job for less than $350.00 *(in U.S.A.)* and will pay for itself in only a few months. It is semi-automatic and can be easily operated by any oil-house or shop employee in less than half an hour a day. There is no mess, no odor, no fire or explosion hazard. All units are assembled in a compact cabinet ready to plug-in and operate. You take no chances due to improper operation: carelessness or lack of attention may reduce production capacity but there is no chance of injury to your motors . . . grit, dirt or other sludge impurities *CANNOT* come through.

Use the adjoining handy post card *now* to send for the fully illustrated bulletin that tells how and why the Bucyrus Oil Reclaimer can give you better lubricating oil at costs averaging about 9 cents per gallon.

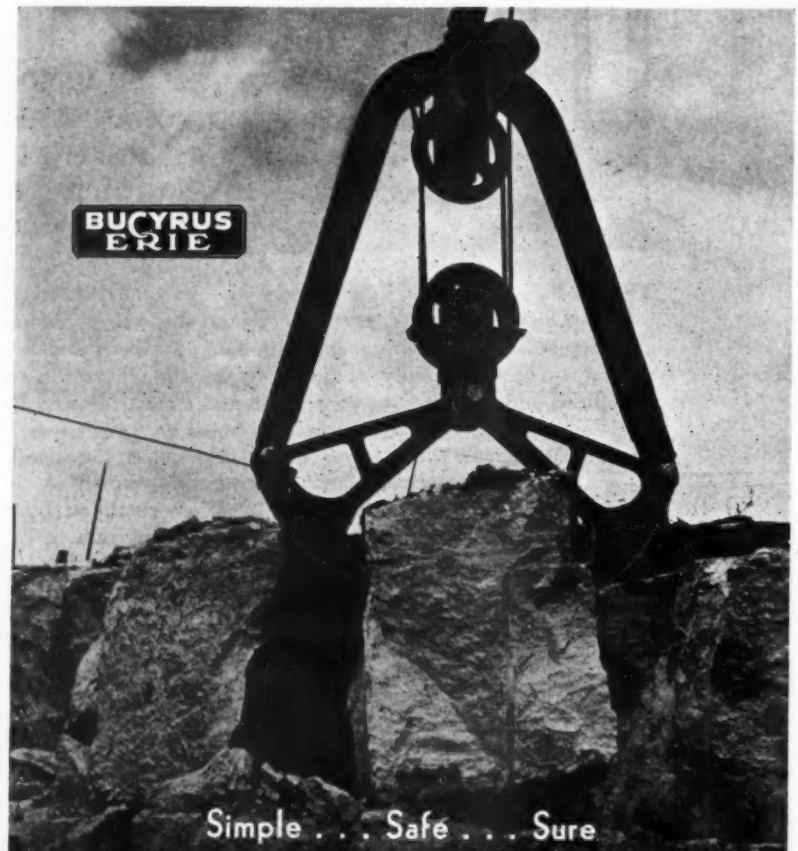
BUCYRUS ERIE

BUCYRUS-ERIE COMPANY, SOUTH MILWAUKEE, WISCONSIN, U. S. A.

$468,000. The successful bid was the lowest of eleven proposals.

The machinery covered in this contract includes twenty frames and track units for the bulkhead gates which will be installed at the upstream end of outlet conduits which will run through the spillway section of the dam; three frames and track units for bulkhead gates which will be installed at the inlet end of the 72-inch penstocks designed to carry water through the dam to the station service generators in the west powerhouse;; and eighteen frames for the inlet gates which will be installed at the inlet end of the big penstock pipes which will serve the large generators in both the east and west powerhouses. The gates which will be installed in these latter frames will control the 18-feet-in-diameter jets of water which will turn the big 150,000 horsepower turbines.

The frames will be of structural steel and bronze and will be imbedded in the concrete at the entrances of the outlet conduits and penstocks and will serve as seats and guides for the bulkhead gates. The bulkhead gates in the penstock system will be used to prevent water from entering the penstocks in emergencies and to seal off the individual penstocks until such time as other control mechanisms are installed.



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BUCYRUS-ERIE

EXCAVATING, DRILLING, AND MATERIAL HANDLING EQUIPMENT...SOUTH MILWAUKEE, WISCONSIN, U. S. A.

Two Reclamation Dams Completed

Completion of Unity dam in Oregon and Alamogordo dam in New Mexico has been announced by the Bureau of Reclamation.

Unity dam, an earthfill structure faced with rock, is 78 feet high and will store 25,260 acre-feet of water to supplement the irrigation supply of about 9,000 acres on the new Burnt River Federal irrigation project above Willow Creek and, through regulation of the run-off, indirectly benefit an equal acreage in Unity Valley. The contract for construction of Unity dam was awarded December 16, 1935 to J. A. Terteling & Sons, of Boise, Idaho, on their bid of $273,989.

Alamogordo dam, which will store the principal irrigation supply for the old Carlsbad Federal reclamation project, supplementing McMillan dam, is an earthfill structure 142 feet high which has created a reservoir with a capacity of 157,000 acre-feet. The contract for construction of Alamogordo dam was awarded January 25, 1936 to the Hallett Construction Company, of Crosby, Minnesota, on its bid of $1,132,547. On December 8, 1936, plans for the dam were changed to increase its height by 7 feet, adding an estimated $175,188 to the cost. Last year, although incomplete, Alamogordo dam caught and held a flood of unprecedented height in the Pecos River, preventing damages to farms and cities downstream which at the time were estimated at $1,000,000.

Completion of these two dams, together with completion of the foundation for Grand Coulee dam in January, brings to eight the number of major storage and conservation structures completed by the Bureau of Reclamation since its expanded construction program was launched in 1933 with allotment of Public Works Administration funds for new construction. The eight completed include Unity dam; Alamogordo dam; the foundation of Grand Coulee dam; Taylor Park dam, an earthfill structure 200 feet high on the Uncompahgre project in Colorado; the Agency Valley dam, a 93-foot earthfill structure on the Vale project in Oregon; the Hyrum dam, a 90-foot earthfill structure on the Hyrum project in Utah; the Pine View dam, a 100-foot earthfill structure on the Ogden River project in Utah; and the Rye Patch dam, a 75-foot earthfill structure on the Humboldt project in Nevada.

Other dams which now are nearing completion include the Alcova dam of the Kendrick project in Wyoming; the Bull Lake dam of the Riverton project in Wyoming; the Midview and Moon Lake dams of the Moon Lake project in Utah; Parker dam on the Colorado River 155 miles below Boulder Dam; and the Imperial dam on the Colorado River near Yuma, Arizona, which will head the All-American Canal.

John C. Page, Commissioner of Re-

For your convenience in writing to Bucyrus-Erie Co., you will find a card bound in this issue.

● On job after job, the Austin-Western 5-Yard Scraper lives up to its reputation for earning the highest return per dollar invested of any scraper in its class. In a recent letter commenting on his experience with two of these fast stepping A-W Scrapers, Mr. V. L. Bearl, Hart County Grade Foreman says:

"I have been doing grade work for fifteen years and I have never yet seen anything that will in any way equal your 5-Yard Single Cable Scraper with its ease of handling and its ability to fit into any place.

"We hardly ever have to plow up ground for the scrapers unless it is a very hard old road bed or very hard rock. These scrapers cut soft rock almost as easily as dirt. I had a haul today of about a 1,000-foot distance and I moved *1,550 yards of dirt.*"

This extraordinary capacity is largely due to the easy, positive means used by the Austin-Western 5-Yard Scraper to simplify and speed up digging, carrying and spreading.

When scraper digs, pan floor is level with ground—all wheels track inside of cutting edge . . . ability to make 180° turns, permits quick return from dump and easy handling. Operator can dump the entire load . . . or spread it to any depth up to nine inches . . . while traveling at full speed ahead.

Electric welded construction assures long, low-cost life and ability to withstand hard usage. Single cable, operating from winch on tractor, controls all operations. 35-40 h. p. tractor is ample power under normal working conditions. Write for complete engineering data and performance records on these 5-Yard Scrapers. They're *low in first cost,* and economical in operation.

THE AUSTIN-WESTERN ROAD MACHINERY CO.
AURORA, ILLINOIS

View of an A-W 5-Yard Tractor Scraper on 21 mile road job near Mt. Vernon, Ill. . . showing machine's exceptional ability to run close to edge of fill for efficient dumping.

AUSTIN-WESTERN

The Austin-Western Road Machinery Co.
1821 Barrows St., Aurora, Ill.
Tell me more about the A-W 5-Yard Tractor Scraper and its extraordinary dirt moving capacity.

Name.....
Address.....State.....SS811
City.....

When writing to The Austin-Western Road Machinery Co., please use coupon or card bound in this issue.

● **Fresno Dam, part of the Bureau of Reclamation Milk River project near Havre, Montana, is being constructed by Wachter-O'Neal & Megarry Bros. This view shows concrete placing in the spillway stilling basin.**

clamation, also reported that plans had been completed for three dams upon which work should be begun in the next few months. These are the Vallecito dam of the Pine River project in Colorado; the Deer Creek dam of the Provo River project; and the great Shasta dam of the Central Valley project in California.

Caterpillar 1937 Earnings

In its annual report covering 1937 operations, Caterpillar Tractor Co., Peoria, Illinois, showed a net profit of $10,168,689.66, second largest profit since formation of the present company in 1925. The 1936 net profit was $9,849,-592.50. Net sales for 1937 totalling $63,183,487.63 were the largest in the company's history.

This report is especially interesting in that it is issued not only to stockholders, as is the general custom, but to employees as well. The company felt, in thus addressing the report, that stockholders and employees had many interests in common, and that the both should have information regarding the operations of the company in order to weigh better various present economic, social and political theories. Thus, in addition to financial statements, the report contains much interesting general explanatory material.

Fort Peck Dam Progress During 1937

Any standpoint from which one considers the Fort Peck Project reveals extraordinary accomplishment. Whether it be dredging, tunneling, concrete work or pile driving the Army Engineers have shown themselves on this record-breaking Project as an efficient construction agency.

Efficiency in the record of any large-scale organization is cumulative and this has been amply demonstrated by operations at Fort Peck during the year 1937. 1936 showed a grand total of 28 million cu. yds. of hydraulic fill placed in the dam and it would seem as if this might have been the maximum quantity for any one year's work, especially in view of the fact that diversion of the river, vast movement of floating equipment, and closure of the main river channel section would inevitably be accompanied by considerable delay. Nevertheless, 1937 dredging operations materially surpassed the 1936 performance and rolled up a total of 32 million cu. yds. of fill placement for the season.

In addition to increasing the output of the dredges, several items of construction work were brought to completion during the year. In chronological order, there was first the completion of the plate steel lining for No. 1 tunnel, the so-called "power tunnel", by the Chicago Bridge & Iron Works. This firm wound up the fabrication of over 15 million pounds of steel plate with a memorable burst of efficiency. The 70-ton sections of 24' 8" pipe were installed by government forces in No. 1 tunnel providing watertight pressure lining from the main control gates to the outlet portal.

The second big event of the year was

THE "EXCAVATOR"

for UNDERPASS, SUBWAY, ALLEY and OTHER CLOSE QUARTER WORK because it digs and loads in a straight line;

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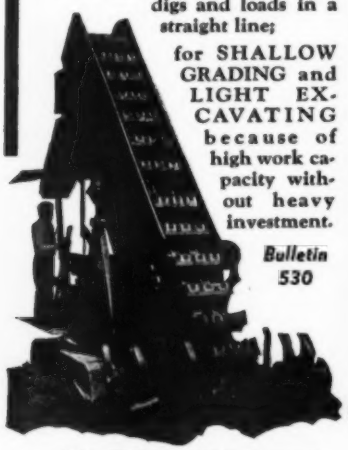
Bulletin 530



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Bucket Loaders — Portable Conveyors

SAUERMAN LONG RANGE MACHINES

When you have a problem of handling sand, gravel, clay, loose ore, coal, etc. over any length of haul from 100 to 1500 ft., it is economy to use a machine that digs, hauls and places the materials in one operation. Try a Sauerman Slackline or Drag Scraper on your long range material-handling work.

SAUERMAN BROS.

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completion of the fourteen-mile railroad from Harlem to Snake Butte Quarry by Tomlinson-Arkwright Construction Company of Grest Falls opening up an entirely new source of quarry stone for use as rip-rap on the reservoir face of the dam. The railroad completed, government forces immediately started large scale production of stone by blasting down sections of the huge columnar structure of the natural deposit.

Following close on the heels of the quarry opening, the Bartlett Hayward Company completed their contract June 9 for furnishing and placing the tractor-type emergency control gates for the tunnels together with beautiful reinforced concrete buildings to house the gates.

While the above contractor was putting finishing touches to his work another, The Standard Asbestos Mfg. & Ins. Co., was started on the job of cleaning and enameling the steel lining of No. 1 tunnel with a view to completing the same in ample time before the tunnels were put into use to divert the Missouri River. At the same time also, government tunnel forces were maintaining their carefully-drawn schedule of operations to complete the concrete work in the remaining three bores by June 25th.

This brings us to the middle of June and trouble. At that time the unpredictable Missouri River went on a minor rampage with a sudden freshet which threatened to delay closure operations scheduled for the end of the month. Meeting the unexpected natural forces of the river with a burst of energy, government forces succeeded in passing the flood waters through the main river channel and in saving the upstream toe trestle so vital to closure operations.

However, a sort of rear guard action of the river as it receded caused sudden and unexpected sloughing of the east river bank at the downstream toe of the dam near the railroad bridge. This sloughing threatened to put the vital steel railroad bridge out of commission and consequent stoppage of all train movements from Fort Peck to the east side of the Project.

With characteristic decision, Lt. Col. T. B. Larkin, the District Engineer, scrapped the detailed plans, carefully made over a period of many months, and on June 24th ordered closure to be made at the steel bridge instead of the upstream toe trestle. This decision embodied the logic of utilizing every carload of gravel and rock material to serve a twofold purpose. First, every carload dumped added stability to the supporting piers of the bridge and second, closed off flow of the water down the old channel and forced it through the diversion tunnels rushed to completion only a few hours before.

While all this work was going on at the quarry, at the tunnels and at the dam, the spillway contractors were not idle. The three of them were equally hard at work striving to complete the elaborate flood discharge channel before the end of the year. August saw completion of the largest contract by the Massman Construction Co. (Spillway Builders) who did the major part of excavation and placed concrete lining for nearly a mile of the great flood carrier. This left the contracting firm of Addison Miller and Fielding & Shepley to finish the gate structure and the cut-off wall at the ends of the channel concrete. Working along with the above contractor, the McKiernan-Terry Corporation set gate operating machinery and controls as fast as the foundations were completed.

Taking full advantage of favorable open weather, dredging operations continued until December 8 when the last of the four dredges shut off the motors and closed the longest season's operations during the life of the project, 249 days. From May 1st to October 21st, fill went into place in the dam at an average rate of 5,900 cu. yds. per hour, day and night. The real average was higher than this since this rate takes no account of the delays incident to closure during the busy week of June 20-26. When the smoke cleared away, surveyors measured a total of 82,320,400 cu. yds. of hydraulic fill in place in the mammoth barrier.

All Perfectly BALANCED

There must be a certain amount of stretch in a wire rope. Otherwise sudden jerks would snap it. But overemphasis on elasticity, or any *single* property, destroys the balance and lowers the general efficiency.

Our eighty-one years of manufacturing experience have taught us how to build into "HERCULES" (Red-Strand) Wire Rope the required elasticity to withstand the ever present jolts and jars. To preserve and cooperate with that elasticity we add strength . . . flexibility . . . toughness . . . and durability—all in proper balance, and all working together to make a powerful, dependable, long-lived wire rope that assures you economical performance.

For Maximum Efficiency in *Preformed* Wire Rope, Use . . . PREFORMED "HERCULES" (Red-Strand) WIRE ROPE Available in Both Round Strand and Flattened Strand Constructions

You'll get more out of "HERCULES" (Red-Strand) because we put more into it . . . a trial will prove it.

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For your convenience in writing to A. Leschen and Sons Rope Co., you will find a card bound in this issue.

NOT in the *Contract*

An Englishman, new in a Mexican mining camp and undecided whether one of his companions at mess was an American or a native who spoke English, finally ventured the query: "Are you a foreigner here, also?"

The fellow gazed at him for a wrathful moment then: "Foreigner? Hell, no! I'm an American."

Girl Visitor—Are you one of the firm?

Bookkeeper—Well, I'm not one of the very firm.

Mistress: "This food tastes terrible. Did you salt it?"

New Cook: "Yes'm, with that new brand called Epsom Salts."

Tommy: "Mother, let me go to the zoo to see the monkeys."

Mother: "Why, Tommy, what an idea! Imagine wanting to go to see the monkeys when your Aunt Betsy's here!"

Friend: "Which of your works of fiction do you consider the best?"

Author: "My last income tax return."

No clergymen being present at a recent luncheon, the host singled out a pious, solemn-looking man in a black coat and tie, with a religious appearance, and asked him to pronounce a blessing.

The gentleman after being addressed put his hand to his ear and craned forward intently.

"I can tell you're talking to me, sir," he said loudly, "but I'm so damn deaf I can't tell what in hell you're saying."

An amusing error occurred when the newspaper make-up man ran a list of births under the heading, "What the Women are Doing."

It never occurs to a boy of eighteen that some day he will be as dumb as his father.

A tiny girl asked her Scotch parents:

"Mother, what are prayers?"

"Messages to heaven, my dear," replied the mother.

The child's comment was:

"Does father always say his prayers at night to get the low rate?"

"Missus says she is not receiving, sir!" said the maid to the man at the door.

"Go back and tell her I'm not delivering today," said the caller, "I'm collecting."

"Winter draws on," remarked Gus as he tucked Maggie into his cutter for an old-fashioned sleigh ride.

"Is that any of your business?" Maggie asked icily.

Contractor (on telephone): Hello, what are you doing?

Woman's voice: Getting ready for church.

Contractor: Sorry. Wrong number.

● "I knew it was a mistake to send her those flowers!"

At a recent party, a game called for each participant to represent the title of some famous book or novel. One elderly lady appeared with a large picture of the Dionne Quintuplets pinned across her gown. She said she represented Sinclair Lewis' novel, "It Can't Happen Here."

Two dairies were rivals for trade.

One of the companies engaged a daredevil motorist to drive a car round the town for 100 hours without sleep. The management decorated the car with large placards reading:

"This d a r e d e v i l drinks our milk."

The rival company came out with placards twice as large, reading:

"You don't have to be a daredevil to drink our milk."

ROEBLING

WIRE · Wire Rope · Welding Wire · Flat Wire · Bare and Insulated Wires and Cables · Wire Netting and Cloth. John A. Roebling's Sons Co., Trenton, New Jersey.
Branches in Principal Cities
The pacemaker in wire rope development

Here Is a Bargain
in used excavating equipment

(taken from page 188)

BUCYRUS-ERIE 43-B—Diesel shovel. 2 yard dipper. Caterpillar Diesel D13000 engine. Reported good operating condition. Located New Mexico. Box 2074-SS.

For other bargains in shovels, draglines, cranes, locomotives, trenchers, and miscellaneous contractors' equipment turn to pages 186 to 190.

The largest listing of Used Equipment offered by any Publication Serving the Excavating Industry.

HAYWARD BUCKETS

WON'T QUIT OR CAUSE TIME OUT

A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

THE HAYWARD COMPANY
52-54 Church Street
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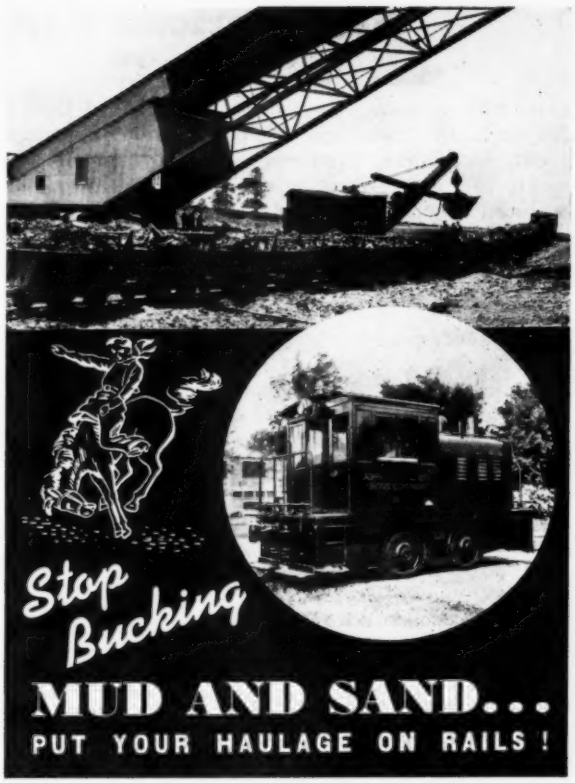

Why waste haulage power in fighting ground resistance and plowing over temporary roads? Whitcomb Locomotives on smooth, easily transportable steel track, permit one man to haul more loads with less fuel. And Whitcomb Locomotives effect additional savings because they give more years of service at lower up-keep cost. Compare Whitcomb Locomotives also with other similar equipment. Discover the extra quality resulting from Baldwin-Whitcomb combined resources and experience.

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Our large line includes the right type of power for every purpose. Let our engineers survey your needs and give you real operating cost figures. There is no obligation incurred.

YOUR CHOICE OF POWER

Gasoline or Diesel Mechanical Drive
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Subsidiary of The Baldwin Locomotive Works. All sales made by The Baldwin Locomotive Works, Paschall Station Post Office, Philadelphia, Pennsylvania.

WHITCOMB LOCOMOTIVES

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All-American Canal

(*Continued from page 161*)

cial air cleaner, designed by Major L. D. Crawford, vice president of the firm, was installed to clean the air. 4-inch pipe lines were laid each way along the hillside above the right of way. The entire channel was drilled to about 5 feet below bottom, requiring a maximum depth of sixty feet. Holes were spaced from 10 to 30 feet, according to the hardness of material, and were fired by a hookup to an electric generating unit. So well was the earth broken up, that scarcely any secondary blasting was required.

Interesting Repair Job

About 600,000 cubic yards were blasted, of which 122,000 cubic yards were classed as rock (the original estimate was 10,000 cubic yards). Moving back to the upper end of this area, the draglines scooped out the two miles of channel in about 4 months. Their job completed, the draglines were parked by the government railroad, for overhaul. In this connection the repair on a 450 h.p. Fairbanks-Morse diesel engine is extremely interesting.

A horizontal crack some 27 inches long had developed in the sub-base, near the top. Inspection showed that five of the 2½-inch vertical braces inside the base had broken loose at one end. They were removed and the stud holes in the top of the base drilled on through and threaded with a special tap section of tool steel, welded on the end of a threaded bar, giving a total length of 32 inches. This guided the tool into the lower part of the base. Special threaded studs of nickel steel, 2¼ inches in diameter, were inserted in these holes, with 10 inches projecting above to hold the cylinder block and 1¼ inches projecting through the base.

Five and-a-quarter inches of the studs near the bottom end are 4½ inches in diameter, threaded on both ends, with 3 inches of taper threads at the top. A 2-inch collar, 6-7/16 inches in diameter, with slots to take a spanner wrench, screwed on this section and a 1 inch by 8 inch collar on the bottom end. With the studs in place a spanner was used to tighten the collars and the lower one was welded fast. The threaded end of the stud projecting through the base was also welded from below. The horizontal crack was veed out with a chipping tool and welded up, after which five bars of 1-inch steel were shaped and welded across the break.

● Construction of 120 Wash Siphon was part of the Frazier-Davis Construction Co. work. They are now 100 per cent complete on Schedule 645.

Another job of special interest in connection with the rock schedule was the construction of a powder magazine from ¾-inch scrap plate. This was cut to shape with a torch and assembled in 12 sections at the Callahan shops. Each section was numbered, the assembly taken apart and hauled to the site, and re-erected. The heaviest sections weighed about 8,000 pounds. The inside was lined with wood, on 2 by 4 studs and all metal, even nails, covered. Screened metal vents at top and bottom kept out dangerous insects or snakes, while doors of the heavy steel plate excluded any human intruders. Roof and sides were banked with earth.

Working westward from Andrade (where early operations were described in the August, 1935 issue of Excavating Engineer) the other big Callahan walking dragline, supplemented by one, and part of the time by two, smaller walking rigs, completed the sand dune schedules 4, 5 and 6.

Blow sand became moderately

ALL-AMERICAN CANAL CONTRACTS

(Status as of January 31, 1938)

George Pollock Company
- Specifications No. 695—100% completed.
- Specifications No. 647—100% completed

W. E. Callahan and Gunther & Shirley
- Specifications No. 573—99% completed.

Griffith Company
- Specifications No. 573—100% completed.

Lewis-Chambers Construction Company
- Specifications No. 621—100% completed.
- Specifications No. 713— 65% completed.
- Specifications No. 717— 63% completed.

Mittry Brothers Construction Company
- Specifications No. 621—100% completed.

Peterson Construction Company
- Specifications No. 686—100% completed.
- Specifications No. 684— 97% completed.

Frazier-Davis Construction Company
- Specifications No. 645—100% completed.

David H. Ryan
- Specifications No. 665—100% completed.
- Specifications No. 668—100% completed.

Bennett and Taylor
- Specifications No. 728—51% completed.

Sharp and Fellows Contracting Company
- Specifications No. 724—36% completed.

A. S. Vinnell Company
- Specifications No. 744—70% completed.

V. R. Dennis Construction Company
- Specifications No. 816-D—100% completed.
- Specifications No. 737 — 51% completed.

Triangle Sand & Gravel Company and Charles Holmes
- Specifications No. 633 —100% completed.
- Specifications No. 907-D— 83% completed.

Pleasant-Hasler Construction Company
- Specifications No. 708—20% completed

Kernan & Klug
- Specifications No. 708—14% completed.

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YOU'RE RIGHT, STAN, WE THINK IT'S ABOUT THE BEST THERE IS.
GENERAL ELECTRIC
TELLURIUM COMPOUND
IT'S TELLURIUM

A shielded, Type SH, cable similar to the type used on this big gold dredge

THE fact that this company, a big gold-mining property on the Pacific Coast, has selected G-E tellurium-rubber cable for its dredge No. 5 testifies to the ability of this cable to stand up under such severe service. The cable shown in the pictures is a shielded-type (Type SH), 3,000 volts, three-conductor, 350,000 cir mils, 1200 feet long.

Ideal for Service

This cable is flexible and does not readily kink; it is light in weight and small in diameter. It has a smooth surface and is little likely to pick up weeds, trash, dirt, or other foreign material. All these features save time in moving the dredge or shovel.

The tellurium-rubber jacket is tough and capable of resisting much abrasion and has long-aging qualities.

Toward Long-term Economy

The constant increase in size of electric shovels and dredges has made the task of selecting a type of trailing cable difficult. Voltage, loading cycles, heating, regulation, protection to workmen, economics — all these factors must be taken into account.

You profit most when the cable is right for each job. To this end, make full use of the services of a G-E cable specialist and get the most for your cable dollar. He can help in the selection of the *right* type—for long-term economy. Address nearest G-E sales office or General Electric Company, Dept. 6-201, Schenectady, New York.

ALWAYS THE RIGHT TYPE FOR EACH JOB

GENERAL ELECTRIC

520-139

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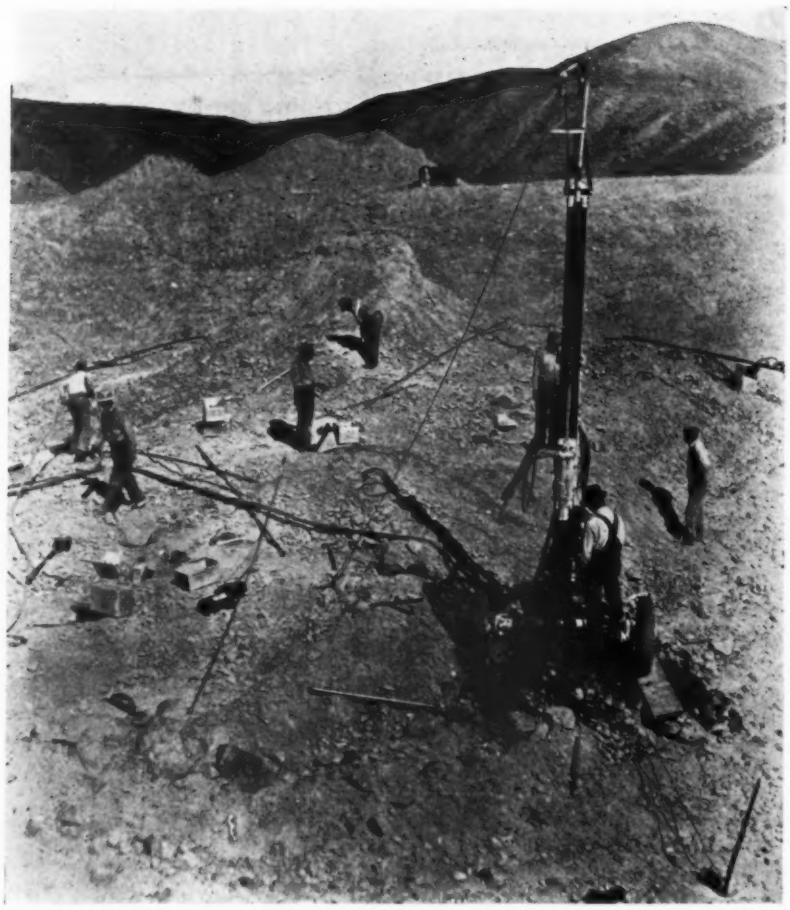

● Sand was a major excavating problem on the Canal, but there was plenty of rock to be handled. This is a drilling operation on the Callahan and Gunther & Shirley 2-mile rock section.

deep on the western part of schedule 5. In this region some leg and jaw bones of a mammoth were uncovered below the mesa floor, and are on display at the Yuma office of the Reclamation Bureau. Crossing to the north of highway 80 two of the walkers skipped, for a time, the shallow excavation near the highway maintenance station and plunged into the deepest area of dunes on the west portion of schedule 6. For seven months during the winter one dragline, with a light-weight 16 yard bucket, battled 80 feet of blow sand on an 1100-foot dune at the extreme west edge of the contract, while the smaller rig excavated the shallower dunes on that schedule.

With 80 feet of blow sand and 20 feet of heavier sand and gravel below the mesa floor at this point the only feasible method of excavation was adopted. Going back 500 to 700 feet from the center line of the canal, immense borrow pits were scooped out with the oversized bucket, casting the sand as far as possible with the 160-foot boom. As the area which was to become a canal was stripped, the borrow pits on each side became mountains of sand. Sections of the big cut were finally completed, working from the eastern end toward the west. This final cut into the heavy material below the mesa floor was spread over the berms, operating road and the inner face of the spoil mountains, to prevent the light sand blowing back into the excavation. Careful calculations allowed space for this last material.

Throughout the dune area the heavy material from the bottom of the excavation was used to blanket the blow sand. Once or twice adverse winds whipped waves of sand into the channel before the berms could be covered, but in general the procedure has been successful in holding back the sand tides which baffled the sponsors of previous irrigation projects. The usual procedure, in the lighter dunes, was to strip off the blow sand for perhaps 1000 feet, then walk back and rough out the channel with the two draglines. Smaller machines finished the slopes, and the bottoms and berms were smoothed with bulldozers. The contract subbed by Callahan Company from Mittry Brothers, station 2740 to 3090-'75, was all common. It was routine digging, in sandy mesa.

Boyce & Igo Subcontract

Going back to schedule 3, subbed by Boyce & Igo, routine digging marked the latter months of this firm's work on the canal. In November of 1935 they excavated 543,000 cubic yards. Incidentally, an outstanding welding job was done on the walking gear of one big machine, without removing it from the shaft. The repaired gear is still in use on another job. The schedule is completed, except for some canal plugs at Araz, where two bridges and an overchute have been constructed. The Igo draglines have been moved across the Colorado river to the Gila Valley project, where they are now working.

Griffith Company

Schedule 7, station 1140-'50 to 1148-'50, and stations 1161 to 1170, comprising 500,000 cubic yards of rock and 40,000 cubic yards of common, was finished by the Griffith Construction Company for the contract price of $226.800.

Later, slides on the slopes of the big rock cut led to the widening of the slopes, the contract for which was let to the V. R. Dennis Construction Company, for $32,-500. It involved 50,000 yards, nearly all rock. This was one of the really spectacular jobs on the canal. Loose surface ground was pushed over the edge of the 115-foot bank with a bulldozer. The rims were drilled with a wagon drill; the slope with jackhammers, the jackhammer men wearing safety lines at work. Blasted material was loaded off the canal bottom with a shovel, into side-dump

cars, on track laid through the cut, and hauled to a dump.

Lewis-Chambers Job

Three schedules of canal excavation, from station 1860 to 2740, were awarded the Lewis-Chambers Construction Company for $505,506. The total yardage was estimated at 7,789,000 cubic yards.

The terrain is level on this section, except for small sand dunes. The growth is light and little clearing was required. Excavation is largely sand, with patches of gravel and clay below the mesa floor. A few hard spots were encountered, including from 8 to 12 feet of cemented gravel extending about 4000 feet east from station 2300, and a section some 5000 feet long of hard clay near drop No. 3. In this clay, presumably the bottom of an ancient body of water, were found a number of bones from some gigantic pre-historic animal. One of these was a jaw bone, with a tooth 11 inches long. In these hard places it was necessary first to excavate a trench some 15 feet wide to facilitate digging the remainder.

General practice in excavating through the mesa was to dig a comparatively narrow trench down the middle, then walk back and excavate to neat line from a position just inside the cut stakes, on first one side and then the other. The 5-yard walking dragline used on this job, with a crew of three men, has handled excavation running over 16 feet deep, with two other draglines operating separately. The bottom was finished with a bulldozer, and the slopes smoothed by two tractors, on bottom and berm, with a 2 inch cable stretched between. A wooden float was used on the berms. The operating road was 27 feet above the bottom, but where the mesa floor will be below water line the dune sand was stripped off for 20 feet back of the cut stakes and the mesa floor bond-plowed, using a two-bottom lister, strengthened by welding on reinforcements at points of greatest strain. The only re-handling required was at highway crossings and drops, where spoil banks had to be kept 200 feet from the structures.

A 10,000-gallon storage tank was placed on cribbing beside the highway for fuel oil, which was delivered to the 5-yard dragline with a tractor and crawler wagon carrying a 2000-gallon tank. The other draglines were served their daily oil by "sand fleas" skimming lightly over the hummocks of blow sand with a drum or two at a time. Three of these versatile creatures were used. They were created by stripping fenders and all excess weight from Model A Fords, and using 7-inch tires. Using a minimum air pressure these keep the "fleas" atop of the sand hills, where it is impossible to travel with regularly-equipped cars. They travel at a fast clip, which helps keep them on top. The loose sand made it necessary to mount all field buildings on skids, and they were moved ahead from time to time.

A feature of the Lewis-Chambers job is the use of the lightweight buckets without teeth for most of the excavation. These are oversize, and while they had to be rebuilt oftener than a heavier type, more dirt could be moved at a pass without putting undue strain on the machines. Designed by superintendent C. A. Colin, the buckets were in use on the two smaller draglines from the time the job started. Repairs were necessary a couple of times.

Buckets were built up from boiler plate, cut to shape with an acetylene torch, and joined by electric welding. Points of hardest wear were reinforced by welded plates of plow steel, and the arch by welding on 3 by 3 by ¾-inch angles, in pairs welded together. They are heated with the torch, and bent into place as the welding proceeds, being held firm by C clamps. Patches of new plate were cut and welded on worn sections of the buckets, then hard-faced with cast iron rod.

Force Account Schedules and Peterson Contract

3,285,000 cu. yd. of canal, between stations 3090-'75 and 3325, and stations 3538-'50 to 4200 were excavated by government forces. In between these schedules, totaling 748,000 cubic yards from station 3325 to 3538-'50, a section of canal and a detour for a turnout, at the central main canal of the old valley irrigation system, were excavated by the Peterson Construction Company, of Minneapolis, for a contract price of $54,-862.50.

Personnel

L. J. Foster is construction engineer at the Yuma office of the United States Bureau of Reclamation. Grant Bloodgood is resident engineer for the canal. T. A. Clark is office engineer and J. C. Thrailkill chief clerk for the Bureau. J. K. Rohrer is resident engineer at Imperial dam, assisted by Don M. Forester.

● This construction view shows the Arizona end of the Imperial Dam, now over 85 per cent complete. Water for the Gila Valley Canal will be diverted through the three gate structures in the foreground.

Book reviews

The 1937 Convention Proceedings of the **American Road Builders' Association** has just been published and released in book form.

The contents include the speeches by all of the principal speakers as well as numerous data on all types of road construction. The book is well illustrated and has a number of cross-sectional diagrams and charts to emphasize points brought out in the different sessions.

"How to handle loads safely," a 16-page bulletin describes and illustrates braided wire rope slings for handling machinery and materials of all kinds. **The Macwhyte Company**, Kenosha, Wis. are the manufacturers publishing the booklet.

A new publication by the **Portland Cement Association** deals with the timely subject of architectural principles that apply to the design of bridges. The booklet presents fundamental principles of architectural design, principles that have long been established in the visual arts but re-stated here with particular reference to bridge design. The principles—Unity, Definition and Inflection—are discussed in detail, and their application to a number of practical cases of bridge construction is illustrated. Three renderings and many photographs are included.

Just off the press is the newly revised edition of the **Benjamin Catalog No. 26.** This booklet includes data on the latest improvements in lighting developments of the past year. For a complimentary copy address Benjamin Electric Manufacturing Co., Des Plaines, Illinois.

Fairbanks-Morse vertical hollow and solid shaft polyphase, ball-bearing, squirrel-cage, induction motors are described in a new bulletin 1410 published by **Fairbanks, Morse & Company.** Although these motors were developed primarily for direct-connection to vertical-shaft turbine, propeller and centrifugal type pumps, it is claimed they have found wide application on special machine tools and various other industrial equipment.

Rock drills and associated equipment, including jackhammers, paving breakers, drifters, stope-hammers, wagon drills, jackbits, drill steel, sharpeners, furnaces and blacksmith equipment including jackrod threading devices, calyx and diamond drills, and accessories are presented in a new catalogue, recently published by **Ingersoll-Rand,** Phillipsburg, New Jersey.

The catalogue is profusely illustrated with installation and shop views of all the types of equipment presented, and in addition includes eight pages of such information as metric conversion tables, friction of air in pipes and hose, horsepowers required to compress given quantities of air to specified pressures, and compressor capacities required to operate from one to seventy drills.

The Koehring Company, Milwaukee, Wisconsin, are publishers of a recent bulletin describing and picturing Koehring Dandie Mixers. It contains complete information including specifications and dimensions for all sizes and types of these mixers. The new bulletins are available to all contractors interested in Koehring mixers.

Users of hose will be interested in a four page illustrated folder recently issued by **The Manhattan Rubber Mfg. Division** of Raybestos-Manhattan, Inc., Passaic, New Jersey. The new folder, in addition to showing many actual installations of Manhattan and Condor Hose being used in different industries, also contains a detailed description of the types of hose construction.

The 1937 edition of "Construction Costs," a year book and directory service of the construction industry is available from **Engineering News-Record,** a McGraw-Hill Publication.

This edition contains figures on the volume of construction, cost of financ-

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ing, labor rates, material prices in addition to a list of equipment and materials distributors, producers of basic materials, products, services, etc. Those interested in obtaining this book should write to the publisher at 330 W. 42nd St., New York, N. Y.

C. R. Jahn Company, Chicago, Illinois, have lately issued a 6-page folder dealing with their line of heavy duty trailers. Among those pictured and described are the four-wheel single-purpose trailer, tandem rear axles of rocker beam type, dual oscilating rear axle type, 10 and 12 wheel models, and the semi-trailer, tandem rear axle type.

Trade notes

The Harnischfeger Corporation of Milwaukee announces the recent appointment of Abbot F. Riehle to the position of Sales Manager of the Smoothare Welder and Welding Electrode Division.

The Sawtooth Company, Boise, Idaho, announces the addition to its sales force of T. H. (Ted) Barrett of San Francisco.

Mr. Barrett, a graduate Mining Engineer, has had experience in the Pennsylvania anthracite region and at various mines in Colorado, Utah and California.

He was formerly Sales Engineer for the Bucyrus-Erie and Harnischfeger Companies, and will act in a similar capacity in the Mine and Mill Machinery Division of this company.

The Ransome Concrete Machinery Co. of Dunellen, N. J., makers of Concrete Mixers have just appointed the following agents for their line: Milburn Machinery Co., 1057 West Goodale Blvd., Columbus, Ohio; Graham B. Bright, 914 Grace-American Bldg., Richmond, Va.

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MEAD-MORRISON. ½-yard shovel and dragline. Electric starter and lights. ½-yard Page drag bucket. Buda 4½"x6" gas engine. Generally fair operating condition. Located Minnesota. Box 2057-SS.

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OSGOOD — GASOLINE — COMBINATION shovel, clamshell, and dragline equipped with electric starter. Shovel Boom 19'6"—Dipper Handle 14'—Dipper 1 yard standard and 1½ Beet Loading Type. 40' Clamshell and Dragline Boom. Hercules 6 cylinder 85 H.P. engine. Fair condition — good appearance. Located Colorado. Box 1018-SS.

OSGOOD. COMMANDER. Combination shovel, dragline and clamshell. ¾-yard Rock Type dipper. 35' dragline and clamshell boom. ¾-yard Page drag bucket. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SS.

⅞-YARD

BUCYRUS-ERIE B-2. Extra High Lift shovel. 21'3" boom. 18'4" dipper handle. ⅞-yard dipper. Well cared for. Good condition. Located Rhode Island. Box 2047-SS.

FOR SALE

Address all box numbers c/o EXCAVATING engineer . . . . . at South Milwaukee, Wisconsin

BUCYRUS-ERIE B-2. Extra High Lift steam shovel. 21'3" boom. 18'4" dipper handle. ⅞-yard dipper. Cat. mounted. Fair working condition. Located Chicago. Box 2039-SS.

BUCYRUS-ERIE—1035 GASOLINE SHOVEL. Chain Crowd. ⅞-yard Dipper. 26-in. caterpillar treads. Electric starter. Needs some repairs. Located vicinity Boston. Box 1065-SS.

BUCYRUS-ERIE—B-2—HIGH LIFT Caterpillar Mounted Steam Shovel. Good Operating condition. Located Eastern Pennsylvania. Box 1019-SS.

BUCYRUS-ERIE TYPE B-2, ¾-YARD high lift steam shovel. Located Boston. Box 1089-SS.

BUCYRUS-ERIE TYPE B-2, ¾-YARD high lift steam shovel. Located Lawrence, Mass. Box 1090-SS.

2—BUCYRUS-ERIE—B-2—HIGH LIFT STEAM shovels. 21'3" booms, 16' dipper handles, ⅞-yard dippers. Power boom hoists. Single shaft caterpillars. Located Massachusetts. Box 1119-SS.

BUCYRUS-ERIE—B-2—HIGH LIFT STEAM shovel. 21'3" boom, 16' dipper handle, ⅞-yard dipper. Single shaft caterpillar. Located Vermont. Box 1135-SS.

BUCYRUS-ERIE—Type B-2 Steam Shovel. Reported fair operating condition. Located near Boston. Box 1157-SS

BUCYRUS-ERIE—TYPE B-2 high lift steam shovel. 19'9" boom—16' dipper handle—⅞-yd. dipper. Cat. mounted. Reasonably good condition. Box 1175-SS

MARION MODEL 21 — ⅞ CUBIC YARD steam shovel. Caterpillar mounted. Good working condition. Located Georgia. Box 758-SS.

1-YARD

AMERICAN. Combination 1-yard shovel and dragline. 20' boom. 16' dipper handle. 1-yard dipper. 40' dragline boom. 1-yard Omaha drag bucket. Waukesha 6"x7" 95 H.P. 4-cylinder engine. Generally fair condition. Located Minneapolis. Box 2044-SS.

BUCYRUS-ERIE 32-B—Gasoline chain crowd 1-yard shovel. Electric starter. Single shaft cats. Wisconsin 6-cylinder 5"x6" engine. Few minor repairs needed. Otherwise excellent condition. Located near Boston. Box 2061-SS.

BUCYRUS-ERIE GA-2 GAS-AIR SHOVEL 22'6" boom—16' dipper handle—one yard dipper. Waukesha four cylinder 5¾"x8" engine. Overhauled approximately one year ago. Fair condition. Located Knoxville, Tennessee. Box 870-SS.

BUCYRUS-ERIE—GA-2 Gas-Air High Lift 1 yard shovel. Air starter. Single Shaft Cat. Fair condition. Located Western New York. Box 996-SS.

BUCYRUS-ERIE GA-2 COMBINATION shovel and clamshell. 24' boom. 18'4" dipper handle—1 cu. yd. cast front inserted tooth dipper. 45' boom. Complete clamshell equipment including 1 yard Williams Fav. Clamshell bucket. Air starter. Single shaft cat. Waukesha 4 cylinder 5¾"x8" gas engine. Fair operating condition. Located Eastern Pennsylvania. Box 932-SS.

BUCYRUS-ERIE GA-2 — Gas-air — high lift shovel. Good operating condition. Located Eastern Pennsylvania. Box 945-SS.

BUCYRUS-ERIE 1030 — ELECTRIC TUNNEL shovel. Boom 10 ft. 7 in. Dipper handle 10 ft. 5 in. 1-yd. dipper. Boom hoist 5 ft. 6 in. rear end clearance. 2 motor—power supply 3 phase, 60 cycle, 440 volt. Located Virginia. Box 1068-SS

BUCYRUS-ERIE—D-2 1 yard Diesel Shovel. Atlas engine. Said to be in very good condition. Located South Carolina. Box 1079-SS

BUCYRUS-ERIE GA-2 SHOVEL AND CRANE 22 ft. 6 in. shovel boom, 16-ft. dipper handle, 1 cu. yd. cast front inserted tooth dipper, 60-ft. box type crane boom. Air starter. Good condition. Located Newark. Box 718-SS.

BUCYRUS-ERIE 31-B — 1 YARD STEAM shovel. Located Lawrence, Mass. Make an offer. Box 1092-SS.

BUCYRUS-ERIE 32-B—Gasoline chain crowd shovel. Electric starter. Single shaft cats. Wisconsin 6-cylinder 5"x6" engine. Few minor repairs needed. Otherwise excellent condition. Located near Boston. Box 2062-SS.

BUCYRUS-ERIE 31-B — 1 YARD STEAM SHOVEL. Located Tennessee. Box 1093-SS.

BUCYRUS-ERIE — GA-2 — GAS-AIR — extra high lift shovel. 24' boom, 16' dipper handle, 1-yard dipper. Air starter. Mass. air tanks. Single shaft caterpillar. Located Massachusetts. Box 1121-SS.

BUCYRUS-ERIE—31-B STEAM SHOVEL. 22' boom, 15' dipper handle, 1-yard dipper. Now operating, can be demonstrated. Located Alabama. Box 1130-SS.

BUCYRUS-ERIE—Type B-2 Steam Shovel. Reasonably good condition. Located near Boston. Box 1156-SS

BUCYRUS-ERIE—30-B Electric Shovel. Suitable for power supply. 3 Phase, 60 Cycle, 440 Volt. Machine equipped with 3 motors. Said to be in first class operating condition. Located New Jersey. Box 1162-SS

LORAIN—MODEL 60—1-YARD shovel. Located Southern Virginia. Box 1182-SS

MARION MODEL 7, 1-yard steam shovel. Has not operated in the past five years. New flues recently installed in boiler. Located Buffalo, New York. Box 2006-SS.

MOORE—SPEED CRANE. 1-yd. shovel and 50' boom dragline and crane. Gasoline. Located St. Paul, Minn. Box 2012-SS.

NORTHWEST — MODEL 105 — GASOLINE shovel—1-yard. Located Massachusetts. Box 1123-SS.

P&H MODEL 600. 1-yard gas shovel. 23' boom. 16'9" dipper handle. 1-yard dipper. Waukesha 4-cylinder 6"x7" engine. New type internal clutches, fuel pump instead of vacuum pump. Good condition except few minor repairs needed. Located Chicago. Box 2040-SS.

P. & H. MODEL 600—1-YARD GAS SHOVEL and 40' boom clamshell. Waukesha JL-6"x7" Engine. Located North Carolina. Box 1095-SS.

P & H—MODEL 600, 1 YD. SHOVEL and dragline. Shovel boom 19'6". Dragline boom 40'. Drag bucket included. Waukesha engine. Good condition. Located Central Illinois. Box 1102-SS.

1¼-YARD

BUCYRUS-ERIE. GA-2, Gas-Air. 1¼-yard shovel. Electric starter. Waukesha W.L. 4-cylinder 6¼"x8" engine. Single shaft cat. Extensively repaired recently. Located Texas. Box 2030-SS.

BUCYRUS-ERIE GA-2—Gas-Air shovel. 22'6" boom—16' dipper handle—1¼-yd. dipper. Shop No. 10761. Has had very little use and is in very good condition. Located Maryland. Box 2060-SS.

BUCYRUS-ERIE GAS-AIR GA-2 shovel and dragline. 24' shovel boom. 16' dipper handle. 1¼-yard dipper. 40' dragline boom. Single shaft cat. Waukesha 4-cylinder 6¼"x8" engine. Factory rebuilt 1935. Excellent condition. Located Indianapolis. Box 2041-SS.

BUCYRUS-ERIE E-2 shovel and dragline. 1½-yard Plate dipper. 45' boom plus 10' extension. 1¼-yard Page drag bucket. Electric light plant. Atlas Diesel engine. Engine overhauled since last used. Balance of machine good operating condition, except minor repairs needed. Located Louisiana. Box 2053-SS.

BUCYRUS-ERIE—GA-2 Gas-Air High Lift Shovel. 24-ft. boom, 16-ft. dipper handle, 1¼-yard dipper. Located Virginia. Box 1063-SS.

BUCYRUS-ERIE—GA-2 Gas-Air 1¼ yd. shovel. 45' boom clamshell machine. Single Shaft Cat. Recently overhauled by owner. Located New York. Box 997-SS.

BUCYRUS-ERIE—GA-2 Gas-Air—1¼ high lift shovel. Single Shaft Cat. Electric Starter. Reported good operating condition. Located Eastern Pennsylvania. Box 998-SS.

TWO—BUCYRUS-ERIE—GA-3, GAS-AIR 1¼-yard shovels, Wisconsin D-2—6 cyl. 5¼"x6½" Engines. Good condition. St. Paul, Minnesota. Box 1097-SS.

BUCYRUS-ERIE 41-B — 1¼-YARD STEAM SHOVEL. Located near Boston. Very good price. Box 1096-SS.

BUCYRUS-ERIE—41-B—STEAM SHOVEL. 21' boom, 15' dipper handle, 1¼-cubic yard dipper. Now operating. Will demonstrate. Located Alabama. Box 1131-SS

If You Do Not Find What You Want Listed—Write Us

EXCAVATING engineer
South Milwaukee, Wis.

BUCYRUS-ERIE GA-3 Gas-Air 1¼-yard shovel. Electric starter. Steel cab. Single shaft Cat. Said to be in very good mechanical and operating condition. Located San Francisco. Box 1191-SS.

BUCYRUS-ERIE GA-2—Gas-Air 1¼-yard high lift shovel. Single shaft cat. Air starter. Massachusetts air tanks. Waukesha 4-cylinder 6¼"x8" engine. Good operating condition. Located Maine. Box 2064-SS.

BUCYRUS-ERIE GA-2—Gas-Air 1¼-yard high lift shovel. Electric starter. Single shaft cat. Massachusetts air tanks. Waukesha 4-cylinder 6¾"x8" engine. Good operating condition. Located Vermont. Box 2065-SS.

BUCYRUS-ERIE GA-2—Gas-Air 1¼-yard extra high lift shovel. Electric starter. Single shaft cat. Massachusetts air tank. Waukesha 4-cylinder 6¼"x8" engine. Located Maine. Good operating condition. Box 2066-SS.

BUCYRUS-ERIE GA-3—Gas-Air 1¼-yard high lift shovel and 45' boom clamshell machine. Electric starter. Single shaft cat. Waukesha 4-cylinder 6¼"x8" engine. Few minor repairs needed. Otherwise excellent condition. Located New Jersey. Box 2058-SS.

BUCYRUS-ERIE GA-3—Gas-Air 1¼-yard high lift shovel. Electric starter. Single shaft cat. Massachusetts air tanks. Wisconsin 6-cylinder 5¼"x6½" engine. Good operating condition. Located Vermont. Box 2067-SS.

KOEHRING MODEL 501 1¼ yard gas shovel. Available about August 15. Located New Mexico. Box 879-SS.

LIMA MODEL 101. 1¼-yard gas shovel. Located Lampasas, Texas. Box 2027-SS.

FOR SALE

Address all box numbers c/o EXCAVATING engineer . . . . . at South Milwaukee, Wisconsin

SMALL SHOVELS
Under 2 Yards continued

LIMA MODEL 101. 1¼-yard gas shovel. Located New Braunfels, Texas. Box 2029-SS.

LIMA MODEL 101. 1¼-yard gas shovel. Located Catarina, Texas. Box 2028-SS.

LIMA MODEL 101. 1¼-yard gasoline shovel. 26' boom. 17' dipper handle. Waukesha Model J. K. 6½"x7" engine. Recently rebuilt. Excellent condition. Located Texas. Box 2042-SS.

LINK-BELT — MODEL K-38. Equipped with 1½-yd. Esco dipper and 50' boom dragline including bucket. Weight of machine only 82,000 lbs. Waukesha W.K. 6¾"x8" engine. Overhauled Spring 1937. Not used since. Located vicinity Spokane, Washington. Box 2015-SS.

2 MARION Model 450—Steam Shovels. Good condition. Located Connecticut. Box 1154-SS

MARION TYPE 32 STEAMER. Shop No. 5676, 18-ft. boom, 15-ft. dipper handle, 1¼-cu. yd. Recently overhauled. Box 451-SS.

NORTHWEST MODEL 104, gasoline 1¼-yd. shovel and crane. Located State of Washington. Available March 1. Box 2018-SS.

OSGOOD — HEAVY DUTY — 1¼-yard Steam Shovel. Said to be in good working condition. Will sell on terms. Located Virginia. Box 1061-SS

OSGOOD. 1¼-yard gasoline shovel. 1-yard dipper also available. 4-cylinder Lerol gas engine. Only operated three months since $2,000 repairs applied. Excellent condition. Located Texas. Box 2043-SS.

1½-YARD

BUCYRUS-ERIE—42-B STEAM shovel. 1½-yard Vanderhoef quarry dipper. Very good mechanical condition. Can be demonstrated. Located Georgia. Box 1149-SS.

BUCYRUS-ERIE 37-B—1½ yard Chain crowd gas shovel. Wisconsin D-3 engine. Located Minnesota. Box 2075-SS.

OSGOOD—VICTOR—GAS 1½ YD. SHOVEL & Clamshell. Shovel boom 23'. Clamshell boom 50'. Wisconsin D-4—6 cylinder 5¾"x6½" engine. Reported excellent condition. Located Minneapolis. Box 1111-SS.

1¾-YARD

BUCYRUS-ERIE 43-B—Diesel shovel. 2 yard dipper. Caterpillar Diesel D13000 engine. Reported good operating condition. Located New Mexico. Box 2074-SS.

BUCYRUS-ERIE 43-B late model 1¾-yd. chain crowd shovel. Electric starter. 1½ K.W. Kohler light plant. Buda-Lanova 6-cylinder 5¼"x7" Diesel engine. Located Central New York State. Excellent condition. Box 2019-SS.

5—MARION MODEL 37, 1¾ yard steam shovels, steel cab. Good working condition. Located Minnesota. Box 825-SS.

P&H MODEL 750, 1¾-yd. Diesel Shovel and 60' boom dragline with bucket. 1500 Watt Kohler light plant. Atlas Diesel 6-cyl. 7"x8½" engine. Located California. Box 2014-SS.

SMALL DRAGLINES
Under 2 Yards

½-YARD

MEAD-MORRISON. ½-yard dragline and shovel. Electric starter and lights. ½-yard Page drag bucket. Buda 4½"x6" gas engine. Generally fair operating condition. Located Minnesota. Box 2057-SD

¾-YARD

NORTHWEST MODEL 105 GAS—40' boom dragline and clamshell, including Page "C" drag bucket. Climax engine. Reasonably good operating condition. Located Atlanta, Ga. Box 995-SD.

OSGOOD — GASOLINE — COMBINATION dragline, clamshell and shovel equipped with electric starter. 40' dragline and clamshell boom. Shovel boom 19'6" dipper handle 14'; dipper 1 yard standard and 1½ beet loading type. Fair condition, good appearance. Located Colorado. Box 1018-SD.

OSGOOD. COMMANDER. Combination dragline, shovel and clamshell. 35' dragline and clamshell boom. ¾-yard Page drag bucket. ¾-yard Rock Type dipper. Hercules 6-cylinder 4⅛"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SD.

⅞-YARD

BUCYRUS-ERIE—1035—40' BOOM GASOLINE dragline and clamshell, including 1-yard dragline and clamshell buckets. 26" caterpillar treads. Recently overhauled. Located Colorado. Box 1118-SD.

1-YARD

AMERICAN. Combination 1-yard dragline and shovel. 40' dragline boom. 1-yard Omaha drag bucket. 20' shovel boom, 16' dipper handle. 1-yard dipper. Waukesha 6"x7" 95 H.P. 4-cylinder engine. Generally fair condition. Located Minneapolis. Box 2044-SD.

BUCYRUS-ERIE DA-2 DIESEL-AIR 40' BOOM dragline. No bucket. Atlas Diesel engine. Located Eastern Pennsylvania. Box 872-SD.

BUCYRUS-ERIE — D-2 — DIESEL DRAGLINE. Atlas engine. Located Texas. 40' Boom, 1¼ yd. Page Bucket. Field reconditioned. Available about September 15. Excellent mechanical and operating condition. Box 1020-SD.

MOORE—SPEED CRANE — 50' boom—1-yd. dragline and shovel. Gasoline. Located St. Paul, Minn. Box 2012-SD.

P & H MODEL 600, 1 YD. DRAGLINE and shovel. Dragline boom 40'. Shovel boom 19'6". Drag bucket included. Waukesha engine. Good condition. Located Central Illinois. Box 1102-SD.

1¼-YARD

BUCYRUS-ERIE E-2 dragline and shovel. 45' boom plus 10' extension. 1¾-yard Page drag bucket. 1½-yard plate dipper. Electric light plant. Atlas Diesel engine. Engine overhauled since last used. Balance of machine good operating condition, except minor repairs needed. Located Louisiana. Box 2053-SD.

BUCYRUS-ERIE GAS-AIR GA-2 dragline and shovel. 40' dragline boom. 24' shovel boom, 16' dipper handle. 1¼-yard dipper. Single shaft Cat. Waukesha 4-cylinder 6¼"x8" engine. Factory rebuilt 1935. Excellent condition. Located Indianapolis. Box 2041-SD.

BYERS DRAGLINE, GAS, MODEL 125, 45' boom, 1¼-yd. Omaha bucket (as good as new). Machine in A-1 operating condition. **D. M. Crawford, P.O. Box 86, Brazil, Indiana.**

LINK-BELT — MODEL K-38. Equipped with 50' boom dragline including bucket. Also 1½-yd. Esco dipper. Weight of machine only 82,000 lbs. Waukesha W.K. 6¾"x8" engine. Overhauled Spring 1937. Not used since. Located vicinity Spokane, Washington. Box 2015-SD.

P & H—MODEL 210—55' boom dragline including 1¼-yard Page bucket. Gas powered. Located South Dakota. Box 1172-SD

1¾-YARD

NORTHWEST. Type M—Gas Dragline. 40' plus 10' Extension Boom. 1¾-yard Omaha Bucket—nearly new. Recently put in good repair. Located Missouri. Box 1161-SD.

P&H MODEL 750, 1¾-yd. Diesel 60' boom dragline and shovel. With bucket. 1500 Watt Kohler light plant. Atlas Diesel 6-cyl. 7"x8¼" engine. Located California. Box 2014-SD.

SMALL CLAMSHELLS AND CRANES
Under 2 Yards

⅜-YARD

BAY CITY—⅜-YARD GAS CLAMSHELL. Located near Boston. Box 1084-SCC.

BUCYRUS-ERIE 10-B GAS—combination clamshell, shovel and drag shovel. 14" Cat. treads. Hercules 6-cyl. engine. Good condition. Favorable price. Located Central N. Y. State. Box 2000-SCC.

½-YARD

BUCYRUS-ERIE — TYPE A, ½-yard steam clamshell and shovel. 26' clamshell boom. Cat. mounted. Located Central Illinois. Box 2007-SCC.

BROWNING—½-YARD GASOLINE clamshell and shovel. Clamshell boom 30' plus 10' extension. Clamshell bucket included. Located Maine. Box 1115-SCC.

If You Do Not Find What You Want Listed—Write Us
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South Milwaukee, Wis.

BYERS-BEARCAT gasoline combination crane, skimmer scoop and back hoe. Williams Clamshell bucket included. Located Eastern Pennsylvania. Box 957-SCC.

⅝-YARD

P & H MODEL 204. 35' boom gasoline clamshell. ⅝-yard Kiesler clamshell bucket. Waukesha engine. New cab. Generally very good condition. Located Chicago. Box 2036-SCC.

¾-YARD

BUCYRUS-ERIE—TYPE B, ¾-yard, 40' boom steam clamshell and shovel. Cat. mounted. Located Buffalo, New York. Box 2005-SCC.

BUCYRUS-ERIE 1030 gasoline clamshell and shovel 35' clamshell boom and Owen "M" Model 230 clamshell bucket. 23' shovel boom. 15' dipper handle. ¾ yard dipper. Wisconsin B-3 gasoline engine. Cylinder blocks recently rebored. Machine in fair condition. Located Massachusetts. Box 982-SCC.

BUCYRUS-ERIE TYPE B STEAM combination clamshell, shovel and steam hoe. Machine completely rebuilt 1929. Good operating condition. Located near Boston. Box 517-SCC.

FOR SALE

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BUCYRUS-ERIE—TYPE B Steam clamshell and shovel. 40' clamshell boom. 19'9" shovel boom —16' dipper handle—¾-yard dipper. Also Ford truck with 500-gallon steel water tank and pump. Reported to be in good operating condition. Located New Hampshire. Box 1164-SCC.

BUCYRUS-ERIE TYPE B, steam, ¾-yard 36' boom clamshell and shovel, including ⅝-yard Williams clamshell bucket. Located Central New York. Box 1188-SCC.

NORTHWEST MODEL 105 GAS—40' boom clamshell and dragline, including Page "C" drag bucket. Climax engine. Completely reconditioned. Located Atlanta, Ga. Box 995-SCC.

NORTHWEST MODEL 105, combination clamshell and shovel. 40' clamshell boom. Type "C" Lakewood 1-yard clamshell bucket. 24' shovel boom. 17½' dipper handle. ⅝-yard dipper. Twin City gasoline engine. Reasonably good condition. Located near Chicago. Box 2045-SCC.

OSGOOD — GASOLINE — COMBINATION clamshell, dragline and shovel equipped with electric starter. 40' clamshell and dragline boom. Shovel boom 19'6"; dipper handle 14'; dipper 1 yard standard and 1½ beet loading type. Fair condition, good appearance. Located Colorado. Box 1018-SCC.

⅞-YARD

BUCYRUS-ERIE — 1035 ELECTRIC clamshell. 35' boom. ⅞ yd. Haiss Coal loading bucket. General Electric motor, 40 H.P. 3 phase. 60 cycle, 220 volt induction motor. Machine in excellent condition. Located New York. Box 1101-SCC.

BUCYRUS-ERIE—1035—40' BOOM GASOLINE clamshell and dragline, including 1-yard clamshell and dragline buckets. 26" caterpillar treads. Recently overhauled. Located Colorado. Box 1118-SCC.

OSGOOD. COMMANDER. Combination clamshell, dragline and shovel. 35' clamshell and dragline boom. ¾-yard Page drag bucket. ¾-yard Rock Type dipper. Hercules 6-cylinder 4¼"x4½" engine. Completely rebuilt recently and new engine installed. Bucket very good. Will sell on terms. Located Texas. Box 2038-SCC.

1-YARD

BUCYRUS-ERIE GA-2 COMBINATION shovel and clamshell. 24' boom, 18'4" dipper handle —1 cu. yd. cast front inserted tooth dipper. 45' boom. Complete clamshell equipment including 1 yard Williams Fav. Clamshell bucket. Air starter. Single shaft cat. Waukesha 4 cylinder 5¾"x8" gas engine. Fair operating condition. Located Eastern Pennsylvania. Box 932-SCC.

BUCYRUS-ERIE — GA-2 — GAS-AIR 45' Boom Clamshell Machine. Good Operating Condition. Located St. Paul, Minn. Box 1024-SCC.

BUCYRUS-ERIE GA-2 CRANE AND SHOVEL. 50-ft. box type crane boom. 22 ft. 6 in. shovel boom, 16-ft. dipper handle. 1 yard cast front inserted tooth dipper. Air starter. Good condition. Located Newark, N. J. Box 718-SCC.

BUCYRUS-ERIE — GA-2 GAS AIR Clamshell. 45' boom. Single Shaft Caterpillar. Waukesha 4 cylinder 6¼"x8" engine. Rebuilt since original manufacture. Good operating condition. Located New Jersey. Box 1104-SCC.

BUCYRUS-ERIE—1035—GASOLINE 40' BOOM clamshell. Machine including 1-yard Owen clamshell bucket. Single shaft caterpillar. 24" treads. Located Massachusetts. Box 1120-SCC.

MOORE—SPEED CRANE. 50' boom dragline, crane and 1-yard shovel. Gasoline. Located St. Paul, Minn. Box 2012-SCC.

P. & H. MODEL 600—40' BOOM GAS clamshell and 1-yard shovel. Waukesha JL-6"x7" Engine. Located North Carolina. Box 1095-SCC.

1¼-YARD

BUCYRUS-ERIE GA-2 Gas-Air clamshell and shovel. 45-ft. clamshell boom. 1¼-yd. shovel. Single shaft cat. Recently overhauled by owner. Located New York. Box 997-SCC.

BUCYRUS-ERIE GA-3 — Gas-Air 1¼-yd. 45' boom clamshell and high lift shovel. Electric starter. Single shaft cat. Waukesha 4-cylinder 6¼"x8" engine. Few minor repairs needed. Otherwise excellent condition. Located New Jersey. Box 2058-SCC.

LINK-BELT. MODEL K-2. Gas crane. 50' boom. Also 2 extra 20' inserts to make 90'. Weight 67,000 lbs. Located St. Paul, Minn. Box 2013-SCC.

NORTHWEST MODEL 104, gasoline 1¼-yard crane and shovel. Located State of Washington. Available March 1. Box 2018-SCC.

1½-YARD

BUCYRUS-ERIE. 37-B Electric 50' boom clamshell. Long cats. 24" treads. Single motor. 60 H.P. 220 volt, 3 phase, 60 cycle. Good condition. Located New York. Box 2052-SCC.

OSGOOD—VICTOR—GAS 1½ YD. clamshell & shovel. Clamshell boom 50'. Shovel boom 23'. Wisconsin D-4—6 cylinder 5¾"x6½" engine. Reported excellent condition. Located Minneapolis. Box 1111-SCC.

LARGE SHOVELS AND DRAGLINES
2 Yards and Over

BUCYRUS-ERIE 50-B Diesel shovel and dragline. 2-yd. shovel dipper. 50' boom. Located Eastern Pennsylvania. Box 2021-LSD.

BUCYRUS-ERIE 50-B, 2-yd. steam shovel. Good operating condition. Located Central New York State. Box 2020-LSD.

BUCYRUS-ERIE 100-C. 3-yard steam shovel. Cat. mounted. Fair condition. Located Kansas. Box 2049-LSD.

BUCYRUS-ERIE 95-C. 3-yard steam shovel. Cats. installed 1925. Fair condition. Located Kansas. Box 2050-LSD.

MARION MODEL 60. 2½-yard steam shovel on railroad trucks. Good appearance and condition. Located Kansas. Box 2051-LSD.

1½-T MONIGHAN WALKER. Diesel power. 2 yard bucket, 60-foot boom. Good condition. Reasonably priced. Located Kansas. Box 742-LSD.

CLASS 320 STEAM DRAGLINE, 144-foot boom. 8-yard bucket. Located on Illinois river. A good buy. Box 750-LSD.

CLASS 230 STEAM DRAGLINE. 175-foot steel and aluminum boom. 6-yard RED ARCH bucket. Ready to work. Located near New Roads, Louisiana. Box 751-LSD.

PRICE VERY ATTRACTIVE

BUCYRUS-ERIE 50-B STEAM combination shovel and dragline, shop number 10577. 26' boom, 17' dipper handle, 2 yd. dipper. 50' boom dragline equipment, 1¾ yd. Page bucket. 1 KW 32 volt Moon electric light plant. 54"x9'7" standard coal burning locomotive-type boiler. Also 2 steel underframe flat cars on which machine is now loaded. New 1929. Moved only 250,000 yards of material. Excellent condition. Price very attractive. Located Kansas City, Mo. Deal direct with owner. Box 900-LSD.

2-T MONIGHAN WALKER, 3½-yard bucket. 70 foot boom. Good condition. Reasonably priced. Located Kansas. Box 743-LSD.

70-C BUCYRUS STEAM SHOVEL on Cats. Complete. In operating condition. Shop number 1712. Also one extra three-yard Manganese dipper and sticks. Chicago territory. Box 347-LSD.

CLASS 14 STEAM DRAGLINE, 60' boom. 2 cubic yard Page bucket. Locomotive-type boiler. Thoroughly overhauled and ready for service. Located, Iowa. Box 771-LSD.

2—BUCYRUS-ERIE 100-B steam shovels, worked only 15 months. Also, 2 Ingersoll-Rand Diesel compressors. Very low prices for immediate sale. H. W. Nelson, 1 Wall St., New York.

TWO 3-W MONIGHAN WALKERS, 3½ yards. 70- and 77-foot booms. Good condition. Reasonably priced. Located Louisiana. Box 745-LSD.

BUCYRUS 320-B STEAM STRIPPING shovel, shop number 4205, new in 1925, used less than four years. Located at Toronto, Ohio. Box 74-LSD.

2-W MONIGHAN WALKER, 2½ yard capacity 70-foot boom. Good condition. Priced reasonably. Located Louisiana. Box 744-LSD.

P&H MODEL 900, 3½ yard Diesel Shovel, 33-foot boom, 200 h.p. Fairbanks-Morse engine. Mounted on caterpillars. Box 828-LSD.

BUCYRUS-MONIGHAN 4-W Walking dragline, 80' boom 5½ yard Page bucket, 30' boom insert and 4-yard bucket. Located Tennessee. Box 844-LSD.

ANY FAIR OFFER ACCEPTED

Class 24 steam dragline. 100 foot boom, 5 cubic yard buckets. Skid and roller mounted. Rebuilt 1927 at a cost of $15,000. New locomotive boiler installed 1928. Will accept any fair offer. Located near Fort Worth, Texas. Box 823-LSD.

BUCYRUS-MONIGHAN MODEL 6160—Diesel Dragline. 160' boom. 6-yard drag bucket. Fairbanks-Morse Diesel engine. $15,000 extras added since machine was recently purchased. Will rent. Located Montana. Box 2068-LSD.

BUCYRUS-ERIE — TOWER EXCAVATOR. 130' head tower. 50' tail tower. 12-yard bottomless bucket. Electrical equipment 3 phase 60 cycle 4000 volts Ward Leonard. WILL RENT. Located Louisiana. Box 2069-LSD.

BUCYRUS-ERIE — 55-B — DIESEL SHOVEL. 27'6" Boom, 18' Dipper Handle, 2½ yard Dipper. Atlas Diesel Engine. New 1935. Excellent mechanical and operating condition. Located Oregon. Box 1036-LSD.

FOR SALE

Address all box numbers c/o EXCAVATING engineer . . . . . at South Milwaukee, Wisconsin

LARGE SHOVELS AND DRAGLINES
2 Yards and Over continued

BUCYRUS-ERIE — 52-B — DIESEL 2¼ yard Shovel and Dragline. Atlas engine. Good condition. Located Eastern Pa. Box 1039-LSD.

BUCYRUS-ERIE — 100-B — STEAM SHOVEL. 3 yard Dipper. Revolving machinery, very good condition. Located Montreal, Canada. Box 1041-LSD.

BUCYRUS-MONIGHAN—MODEL 4-T — 4-yard Diesel Dragline. 110' Boom. Good Condition. Located Nebraska. Box 1047-LSD.

MARION—MODEL 350—8 yard Electric Shovel. Power equipment, 3 Phase, 60 cycle, 2300 volt—Ward-Leonard Control. Mounted on railway trucks. Good condition. Located Minnesota. Box 1049-LSD.

MARION—MODEL 70—3½ yard Electric Shovel. Railway truck mounted. Power Equipment, 3 Phase, 60 cycle, 2300 volt. Good condition. Located Ohio. Box 1050-LSD.

PAGE—MODEL 220—2½ yard Diesel Dragline. 85' Boom. Good operating condition. Located Iowa. Box 1052-LSD.

BUCYRUS-MONIGHAN 3-T DIESEL dragline. 80-ft. steel boom, 8 cu. yd. drag bucket, 120 h.p. Fairbanks-Morse type "YVA" engine. 1500 watt Kohler light Plant. Just completed job on Illinois River. Box 1056-LSD.

BUCYRUS-ERIE — 75-B Electric Combination Shovel and Dragline. 29-ft. shovel boom, 20-ft. dipper handle, 2½-yard dipper, 85-ft. dragline boom with mast suspension. Suitable for power supply, 3 phase, 60 cycle, 2300 volt. Induction motors. Said to be in excellent working condition. Located Eastern Pennsylvania. Box 1058-LSD.

BUCYRUS-ERIE 50-B — 2-yard Steam Shovel. Located Texas. Low Price. Box 1059-LSD

BUCYRUS-ERIE 55-B—Extra High Lift Diesel Shovel. 35-ft. boom. 22-ft. dipper handle, 2 cu. yd. Bowl Door dipper. Caterpillar mounted. Kohler light plant. Atlas Diesel engine. Used about three months. Just like new. Located Eastern Pennsylvania. Box 1069-LSD.

PAGE—MODEL 220 — Electric dragline. 90' boom, 3½-yard Page R.C. drag bucket. Box 1124-LSD

BUCYRUS-ERIE—CLASS 24 DIESEL dragline. 130-ft. boom, 4 cu. yd. bucket. Truck mounted. 165 h.p. Anderson Diesel engine. Friction drive. Said to be in good operating condition. Located on Mississippi River near New Orleans convenient for loading on barge. Box 1074-LSD.

BUCYRUS-ERIE—175-B TRACK MOUNTED steam shovel. 85' boom, 53' dipper handle, 3½-yard dipper. Good condition except dipper handle and boiler. Bargain. Located near Pittsburg, Kansas. Box 1134-LSD.

LOCOMOTIVES

LOCOMOTIVES

1 Baldwin Locomotive, 17x24, standard gauge, 45-ton, shop No. 33262.
2 Baldwin Locomotives, 19x26, standard gauge, 6-wheel, shop Nos. 39534 and 39536.
4 American Locomotives, 20x26, 60-ton, shop Nos. 5945, 5949, 42354 and 45323.
All of the above have passed State Boiler Inspection yearly; will stand 240 lb. cold water tests. At present are in actual service in Minnesota Mines. Box 1194-ME.

MISCELLANEOUS EQUIPMENT

BABY MACK—DUMP TRUCK. 4-yard Heil Dump body and 3-ton wood coal body. Hi-Lift Heil Hoist. Pneumatic tires all around. Good condition. Located New York. Box 2048-ME.

FRUEHOFF SEMI-TRAILER with 8' by 40' Deck. (Can be shortened). Single rear axle with 4 wheels each with 36"x10" solid rubber tires. Air Brakes. 16 ton capacity. Excellent condition. Located New York. Box 1160-ME.

DRAG BUCKET

BUCYRUS-ERIE 1½-YARD Type "Y" Drag Bucket. Good condition. Located Kansas. Box 1166-ME

DRAGLINE EQUIPMENT

72-ft. Dragline Boom and Fairlead—Hydraulic Equipment—1 Hoist Drum—1 Drag Drum—1 Boom Suspension, Sway Brace and Suspension Cables. All suitable for application to Bucyrus-Erie Model 75-B Machine. Located Eastern Pennsylvania. Box 1060-ME.

BARGAIN—NEW DIESEL COMPRESSOR ATLAS DIESEL POWERED portable air compressor, 4 cylinder, 60 H.P. engine of dustproof type, skid mounted, self contained, complete with radiator cooling system. Direct connected to a 320 cubic feet Worthington Feather Valve Compressor. Brand new and a bargain to the first comer. Atlas Imperial Diesel Engine Company, Oakland, Calif.

HAISS EXCAVATOR — C7097. June 1930. Weight 11 tons. Needs new teeth. 33" per minute crowding. Price $1800. Box 990-ME.

CAR TRANSPORTER

CAR-TRANSPORTER or stacker with reach of 135' and dumping height of 75'. Equipped with 4-yard aluminum car. Caterpillar-mounted and suitable for use with shovel having per hour output of 250 yards. Electric drive, 3-phase, 60-cycle, 4000-volt current. This car transporter is in excellent condition and priced to sell. Located near Kansas City, Missouri. Box 2010-ME.

SHOVEL EQUIPMENT—Late design—suitable for Bucyrus-Erie 52-B Diesel. Only handled about 4,000 yards material. Equipment located Alabama. Box 1113-ME

FRONT FOR 32 MARION

1½ CU. YD. shovel front end—new dipper—for Marion 32 steamer. Priced right. Located near Chicago. Box 857-ME.

INDUSTRIAL STEAM WRECKING DERRICK. Non-propel. Rating 50 tons at 20' with outriggers. Located Nebraska. Box 1171-ME

BARBER-GREENE—MODEL B-44 ditcher. Located North Carolina. Box 1180-ME

USED CONTRACTORS EQUIPMENT

1—Model 100 Lincoln Revolver with 100' boom and 12' Gantry.
2—275 Koehring Mixers with Electric motors.
1—200-ton Blaw-Knox Bin with weighing batchers, cement scale and push button control.
1—Robinson Pneumatic cement unloader with silo.
1—20-ton Whitcomb Gasoline Dinkey, overhauled.
4—18-ton Steam Dinkeys, overhauled.
12—30-yd. Western Lift Door Air Dump cars.
12—30-yd. Koppel Drop Door Air Dump cars.
26—16-yd. K. & J. Lift Door Air Dump cars.
6—20-yd. K. & J. Lift Door Air Dump cars.
5—2-cu. yd. Blaw-Knox Roller gate Concrete Buckets.
7—70-ton 20x36 Baldwin Switchers.
1500 tons used steel sheet piling—Sections M-111, M-112 and M-115 35 to 50' lengths.
3—Jordan spreaders excellent condition.
Located Mississippi valley. Box 2011-ME.

KOEHRING DRAG SHOVEL equipment for Model 301 machine. Used very little. Low price. Located Eastern New York State. Box 1181-ME

DRAG SHOVEL EQUIPMENT—consisting of 18' boom, 7'6" dipper handle and ½-yd. front-opening dipper suitable for application to Bucyrus-Erie 1020 shovel. Located Rhode Island. Box 2003-ME.

EUCLID-TUWAY 11-CU. YD. dump wagon. Hydraulic hoist. Worked only 320 hours. Located Central New York State. Box 1189-ME.

ERIE AGGREMETER BIN—80-ton capacity with 3 compartments, including weighing scales. Only handled 10,000 tons. Located Central New York State. Box 1190-ME.

If You Do Not Find What You Want Listed—Write Us

EXCAVATING engineer
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MINING AND QUARRY EQUIPMENT

The following equipment is located in Minnesota. Full details on request.

3—Boilers.
12—36" gauge Koppel double truck flat cars.
6—36" gauge Peteler 4-yard two way dump cars.
4—Swing & Boom engines for Marion 31 & 36 shovels.
1—Austin-Western grader, 9' blade and scarifier.
4—Hoists—Single and double drum.
2—Milwaukee gasoline locomotives, 7-ton 24" gauge.
3—Electric motors, 100 to 150 h.p.
8—Pumps—Steam and gasoline.
1—Special Twin City Tractor.
1—Complete Ainley Placer gold machine.

Box 833-ME.

CONTRACTORS — ATTENTION — YOUR REPAIR SHOP NEEDS SOME OF THESE TOOLS

2½" Style 3 Pipe Machine
20" Grinder
60" Pond Radial Drill
Hilles & Jones—Punch
48"x48"x12' Pond Planer
42"x36" Niles—Bement—Pond Milling Machine
10"x24" Style 3 Oakley Grinder
No. 12 Bucyrus-Armstrong Bit Dresser
4500 lb. Fairbanks-Morse—Dormont No. 4 Scale
42"x36"x8' Cincinnati Planer
No. 2 Diamond Single Wheel Wet Grinder
3"x36" Jones & Lamson Turret Lathe
22"x48" Between Centers—Greaves & Klusman Engine Lathe

Box 2063-ME.

WANTED

WANTED: Bucyrus-Erie Diesel shovels, Models 34-B, 43-B, 19-B. State cash prices and full particulars to, B. Caten, Box 54, Postal Station D, Toronto, Canada.

WANTED TO BUY: Trailer—35 to 40-ton capacity — low bed—gooseneck type — pneumatic tires. State condition, location for inspection and cash price. Box 2059-ME.